APPENDIX A

DEAD CREEK CULVERT REPLACEMENT
CONSTRUCTION PLAN

Dead Creek Culvert Replacement Project

Cahokia, Illinois

Date: **July 20, 2000**

Prepared For: **Solutia, Inc.**
St. Louis, MO

Prepared By:

MAVERICK
Construction Management Services, Inc.

AreaI 001243

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AreaI 001244

1.0 Introduction

1.1 History

The USEPA issued an UAO to Solutia Inc. on June 21, 1999. The UAO requires replacement of the culverts on Dead Creek to address flooding of Dead Creek. An alternative proposal to address the cause of the flooding was made to USEPA by Solutia on July 8 at a conference in Cahokia, Illinois. The proposal was formally submitted to USEPA in Solutia's July 17,1999 Response to the UAO. As committed to in the July 8 Cahokia conference and repeated in Solutia's July 17, 1999 Response, Solutia, in a July 30, 1999 correspondence to USEPA, committed to implementing some additional short term plans to address the flooding under the UAO. The Agency responded to Solutia's proposal in a September 24, 1999 letter. In summary, the Agencies approved replacement of the culverts at Cargill Road and the Terminal Railway ROW.

After an Order was issued to Terminal Railroad, Solutia successfully concluded negotiations of an access agreement with Terminal Railroad on February 9, 2000, allowing Solutia to enter the property to perform the UAO required Work at the Terminal RR crossing.

1.2 Purpose

This work plan describes the implementation of the culvert replacement at the Terminal RR crossing. The presence of three gas pipes within the work area requires extra precautions to be taken for the above-mentioned work. This Work Plan has been prepared to address concerns raised by both Phillips Pipe Line and Laclede Gas Company. The Plan will be used by the proposed Contractor to ensure that the approved procedures are followed.

1.3 Site Location and Description

The Terminal RR Crossing at the Dead Creek crossing is located in Cahokia, Illinois approximately 250' east of Cargill Road. The area is heavily overgrown with light brush and small trees. The area surrounding the proposed work area is mainly comprised of wetlands and open fields, which limits access.

Dead Creek is approximately 10' to 12' wide in the area of the Terminal RR crossing. An existing 54" pipe conveys water under the crossing. The 54" pipe is heavily silted and has limited flow capacity.

1.4 Description of Work

The existing 54" steel storm water pipe will be replaced with three 6'X6' concrete box culverts to improve storm water flow and to mitigate flooding of Dead Creek. Due to the depth of the excavation and the presence of the gas pipes, a shoring system will be installed for supporting the excavation activities.

1.5 Coordination

Due to the presence of the three gas pipes additional coordination will be required with the Agencies, Phillips Pipe Line and Laclede Gas Company. It is understood that no intrusive work is to take place in the area of the gas pipes without representatives from each company being present. Solutia's Construction Manger will coordinate all field activities with both companies.

A pre-construction meeting will be held at the site one week prior to the start of work. The following topics will discussed:

- Health & Safety procedures
- General Work Site Rules
- Review of the Work Plan
- Special excavation procedures for the gas pipes
- Schedule
- Documentation requirements

The Construction Manager will document the pre-construction meeting and distribute notes from the meeting.

AreaI 001246

2.0 Culvert Replacement

The culvert replacement at the TRRA embankment will consist of removing the existing 54" steel drainage pipe and replacing it with three 6'X6' concrete box culverts. Three high-pressure pipelines owned by Phillips Pipe Line Company and Laclede Gas Company are located within the TRRA work area and will require protection during the excavation for the culvert replacement. Two of the pipes are located mid slope and the other is slightly off the toe of slope on the northern side of the embankment. All three pipes are in use and pose a high risk if damaged. Due to the location of these pipes, shoring of the excavation will be required. A detail of the shoring can be found in Appendix E.

2.1 Safety Precautions

Because of the risks associated with this excavation extra precautions will be taken to ensure the pipes are not impacted in any way. The following precautions will be taken for the replacement of the culvert:

- The pipes located on the southern embankment will be physically located prior to any intrusive work. The pipes will be located by hand; no heavy construction equipment will be used. The pipes will be unearthed in three locations, on each side (right outside of the proposed H-pile locations) and one in the center of the excavation area. Once the pipes are located they will be marked with orange paint and flagged using 3' high orange grade stakes.

- Shoring (H-piles with lagging) will be installed to minimize the width of the excavation therefore reducing the amount of pipe that will be exposed. Also, by reducing the width of the excavation no lateral support of the pipe should be necessary. Steel boxes, which will be fabricated out of ½ steel plates, will be placed over the pipes to protect them during the H-pile installation phase. A detail of the steel boxes can be found in Appendix A, Sheet 4 of 4.

- A mini excavator, equipped with a straight edge on the bucket, will be used to remove soil over and around the pipe. The mini excavator will not be allowed within 1' foot of the pipe. The remaining 1' of soil will be hand shoveled. As the pipe is unearthed 2" to 3" wide timbers will be strapped around the full lengths of the pipes for protection. The timber protection will be placed on all exposed piping.

- 1" steel street plates will be placed over the pipes before any heavy equipment is allowed to cross over the pipes. A minimum of 12" of soil will be left in place between the pipes and the street plates. No heavy equipment will be allowed within five feet of the pipes once the soil beneath the pipes has been disturbed.

The only crossing of the pipe that is anticipated is for drill rig, which will install the H-piles. A detail of the crossing can be found in Appendix A, Sheet 2 of 4.

- Several steel cables will be strung across the excavation directly over and around the pipe to create a warning zone for the operators. The cables will be flagged with 2' pieces of warning tape every 2 to 3 feet. A detail of the safety cables locations can be found in Appendix A, Sheet 3 of 4.

- Concrete traffic barriers will be placed on each side of the old railroad bed to protect the excavation from unauthorized vehicles entering the excavation area. A piece of heavy equipment will be placed in the access point during non-working hours. High visibility fencing will also be installed around the entire excavation area.

2.1.1 Working Platform

One of the first tasks will be to construct a working platform for the drill rig installing the H-piles. In order to accomplish this, the embankment must be excavated to decrease its height to approximately elevation 407. By lowering the elevation of the embankment, the work area is increased and the height of shoring is reduced. There are 4 H-piles located on the outside of the pipes, which must be accessed from the embankment due to the presence of high voltage wires that are adjacent to the railroad embankment. In order to install these H-piles, the southern slope must be extended approximately 12 feet. The existing 54" pipe will be extended with a temporary pipe to ensure flow through the pipe is not impacted during construction. A detail of the excavation can be found in Appendix A, Sheet 2 of 4.

The excavation to lower the embankment will be performed in the following manner:

- Concrete barriers and safety fence will be installed around the work area to protect from unauthorized access. A detail of the Site Layout can be found in Appendix A, Sheet 1 of 4.

- The two pipes in the embankment will located and flagged in three locations as mentioned above (by hand, no heavy equipment shall be used)

- The excavation to create the working platform will begin on the northern side of the embankment and progress to the south. An 80,000lb hydraulic excavator, equipped with a material-handling bucket will be used to perform the bulk of the excavation. The excavated material will be placed on the southern embankment below the elevation of the pipes.

  A small D4 dozer (or equal) will spread and compact the material to form the extended platform. The dozer will work from the bottom of the southern slope upward. The dozer will not be required to cross the pipes. The large excavator

will used to excavate soil up to within 5' of the gas pipes. From this point a Caterpillar 302.5 or equal (mini excavator), equipped with a straight edge, will be used to remove an additional 4' of soil. The mini excavator has digging force of 3,200 lbs. A product sheet on the mini excavator can be found in Appendix C.

A dedicated pipe spotter will be present during all excavation within 10' of the gas pipes. The spotter will maintain visual contact with the heavy equipment operator during excavation. The spotter will ensure the pipe flagging is maintained during all excavation activities. The remaining 1' of soil over the pipes will remain in-place until the installation of the H-piles has been completed. The 1" steel street plates will be placed over the pipes as soon as the excavation has been completed and before any equipment is allowed to cross over the pipes.

- If soil conditions are found to be poor at the required elevation, a 1' layer of dense grade aggregate will be spread over the entire working platform. The dense grade material will provide a stable base for the heavy equipment.

- The work platform will be sloped to the north to ensure storm water does not erode the soil in and around the pipe during the H-pile installation. If required, a small berm will be constructed around the pipes to protect them from run on.

2.2 Shoring Design and Installation

2.2.1 Shoring Design

The shoring design for the culvert replacement has been prepared by URS Greiner Woodward Clyde Engineers (Woodward Clyde). The shoring design consists of cantilever soldier piles with lagging walls. This design was chosen due to the presence of the two gas pipes in the slope. By using the H-pile design and lagging wall, the shoring can be installed completely around the two gas pipes as the excavation progresses. Woodward Clyde mobilized to the field in February to obtain the necessary geotechnical information necessary to prepare the shoring design. A copy of the boring logs and the design calculations can be found in Appendix B.

2.2.2 H-pile Installation

Subsurface Contractors of 110 Angelica Street, St Louis, MO will install the Soldier piles. Subsurface Contractors (Subsurface) intends to use an Atlantic LDH 100 drill rig to install the piles. A product sheet on the drill rig can be found in Appendix C.

The drilling will start from the south working north. The rig will set up on a hole and begin drilling a 36" drill shaft. Casings will be installed as necessary. HP 14 X 89's will then be hoisted into the hole and concrete poured as the casing is removed. The truck delivering the concrete will not be allowed to drive over the pipes at any time.

Additional concrete chutes will be used. If the distance is too great for the chutes, the large hydraulic excavator will be used. The concrete will be placed in the bucket of the excavator and poured into the casing. The excavator has sufficient reach and will not be required to cross over the pipes.

There are 6 piles that will be installed directly adjacent to the two gas pipes. Extra precautions will be taken to protect the pipes during the pile installation in these areas. Steel boxes constructed from sheet steel will be fabricated and placed over the pipes during the drilling and pile placement activities. The steel boxes will protect the pipe from the rotating auger and the H-piles as they are lifted and set into place. A detail of the box can be found in Appendix A, Sheet 4 of 4. At no time will a H-pile be hoisted over the gas pipes unless either steel street plates or the steel boxes protect the pipe. All properly sized hoisting equipment will be inspected prior to use. Any equipment failing the inspection will not be used on the project until the necessary repairs have been made.

2.3 Excavation

The excavation to install the box culverts will begin on the southern side of the embankment-working north. Soil will be excavated using the 80,000lb excavator. The soil being excavated will be placed to the side of the excavator where a dozer will then push the material over the north embankment to the soil stockpile area. The stockpile area will be covered with geotextile material to act as a marker layer to insure the existing grade is not disturbed during the removal of the soil for backfilling the excavation. Details of the stockpile area can be found in Appendix A, Sheet 1 of 4. A spotter will be present at all times during excavation activities. The spotter will work with the operator to insure the large excavator does not come within 5' of the gas pipes.

Wood lagging will be installed as the excavation progresses. The wood lagging will be placed and packed as necessary. The excavation will not continue vertically more than three feet without he installation of the wood lagging. A competent person will inspect the lagging on a daily basis. Lagging that has become loose will be repacked before excavation continues. Dense grade aggregate will be used to repack the lagging as necessary. Once the entire gas pipes are uncovered, lagging will be installed completely around the pipes to protect the surrounding soils.

Once the large excavator has removed soil up to within 5' of the pipes, a mini excavator will be utilized to remove an additional 4' of soil from around the pipes. The mini excavator will be equipped with a straight bucket (no teeth). The mini excavator will cast the material to the larger excavator for removal from the work area. The remaining 1' of soil will be hand excavated. The safety cables with flagging will be installed as the excavation progresses. Once the pipes have been uncovered, the large excavator will be used to continue excavating material from under and around the pipes. The large excavator will reach over and under the pipes to remove soil from completely under the pipes down to the required invert. Once all the soil has been removed from in front and under the pipes, the large excavator will move back toward the north slope and reach

under the pipe to remove the remaining soils to the required invert for the new culvert pipes. Details of the excavation can be found in Appendix A, Sheet 3 of 4.

Once the required invert is reached, geotextile will be placed on the floor and 5' up the walls of the excavation to protect the lagging from potential erosion during storm events. The geotextile will be fastened to the lagging using 2x4s and nails. 2" stone will be placed over the geotextile on the bottom of the excavation.

2.4 Culvert Placement

Three 6'X6' box culverts will replace the existing 54" steel pipe. Details on the concrete box culverts can be found in Appendix D. A concrete apron will be constructed at each end of the box culverts to protect the underlying soils of the box culverts from being eroded. The new box culvert ends will be placed on top of the apron. The aprons will be fabricated in the excavation using #4 rebar and 4,000 psi concrete. The rebar will be hoisted into the excavation from the north end of the excavation. The rebar will not be hoisted over the exposed pipes. The concrete required for the construction of the apron will be placed with a concrete pump truck, thereby eliminating the need for a concrete truck to be close to the open excavation.

Once the aprons have been constructed, the box culverts will be placed. The box culverts will be placed using a properly sized hydraulic crane. The crane and the rigging equipment will be inspected prior to use. Any necessary repairs will be made before work continues. The crane will be setup on the embankment away from the excavation. The trucks delivering the box culverts will back down the embankment from Cargill Road where the crane will lift the box culverts from the truck and place them into the excavation. The box culverts that need to be placed on the outside of the gas pipes will not be hoisted over the exposed gas pipes. The crane will hoist the box culverts close to the ground over an area of the embankment that has sufficient cover over the pipes. The box culverts must be set from the top of the embankment due to the presence of high voltage lines which run along the embankment. Once the box culverts are set into the excavation, they will be drawn together using hardware provided by the box culvert manufacturer.

2.5 Backfilling

Once all box culverts have been set into place, backfilling will begin. Soil will be placed into the excavation using the large excavator. The excavator will not place material directly over the gas pipes. The material will be placed adjacent to the pipes and spread by hand. Soil will be placed in 8" to 12" lifts and compacted using motorized hand tampers. No large drum compaction equipment will be used. The soil will be placed in even lifts over the full length of the box culverts and brought up evenly. If the excavated soil is not suitable for backfill, dense grade material will be brought in from off site.

As the backfill is being placed the lagging will be removed. Once the lagging around the pipes is no longer required the H-piles around the pipe will be cut as low as possible, away from the gas pipes. The excavation and surrounding soils will not be compromised during this activity.

The backfill will be brought up as close to the pipe as possible. No rock or debris will be placed with in 5' of the pipes. Once the hand compaction equipment can no longer be used under the pipes, the backfill will be brought up on the sides of the pipes and flowable fill will be used to bring the grade up to bottom of the pipes. The flowable fill will be allowed to setup before soil backfilling continues.

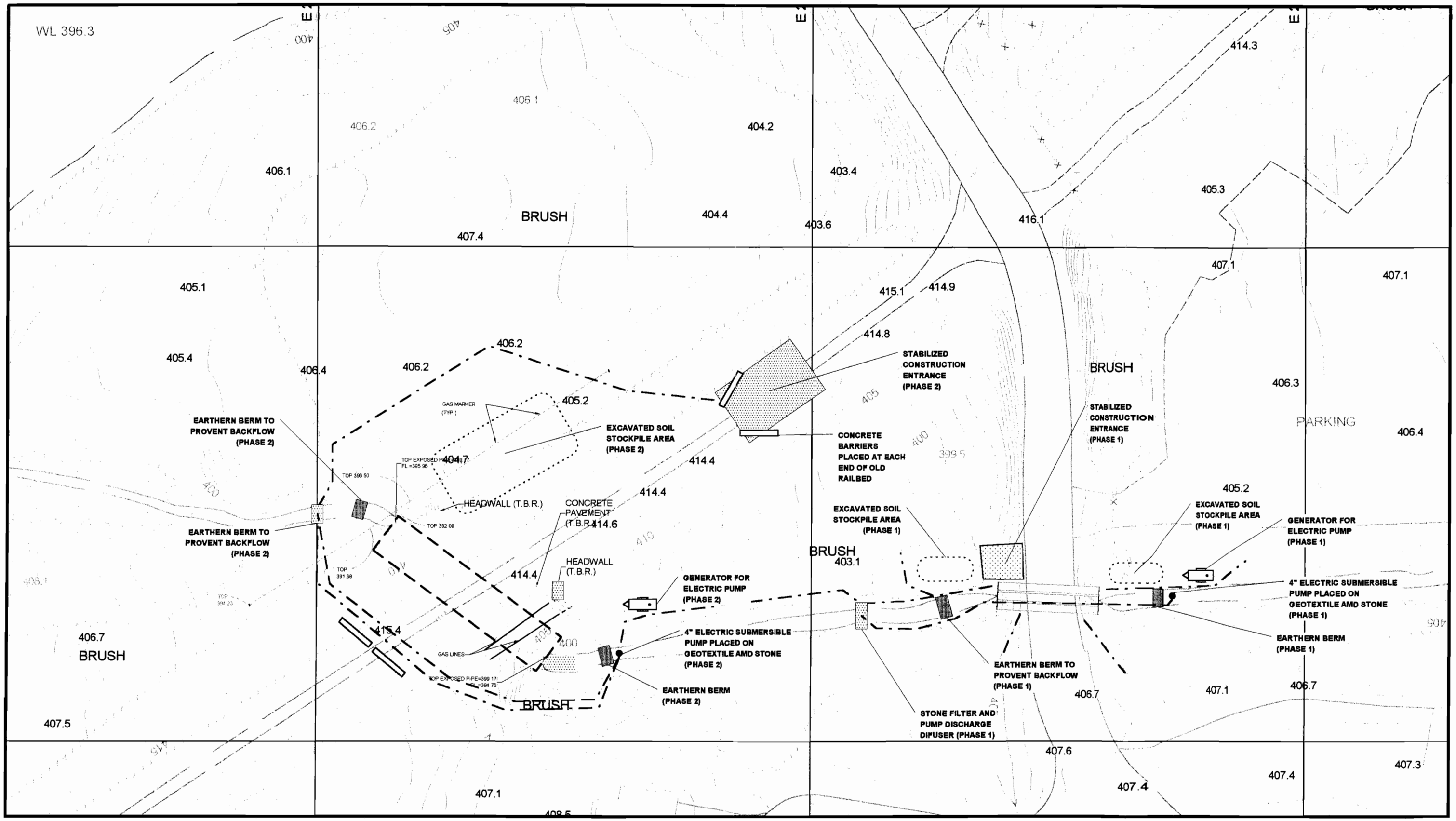
The area will be regraded, topsoiled and seeded as necessary. Erosion fabric will be placed on all regraded slopes and stapled into place. 8" to 12" rip rap will be placed around the concrete aprons to protect the surrounding slope from potential erosion during storm events.

2.6 Demobilization

Once all areas have been restored to their original conditions the Construction Manager will request a walk through by representatives of Phillips Pipe Line Company and Laclede Gas Company. A punch list will be generated from the site walk. The items on the punch list will be addressed before the project is demobilized.

As-built drawings will be prepared and forwarded to all necessary parties.

Appendix A



LEGEND

- Siltfence and Fencing
- Soil Stockpile Area

NOT TO SCALE

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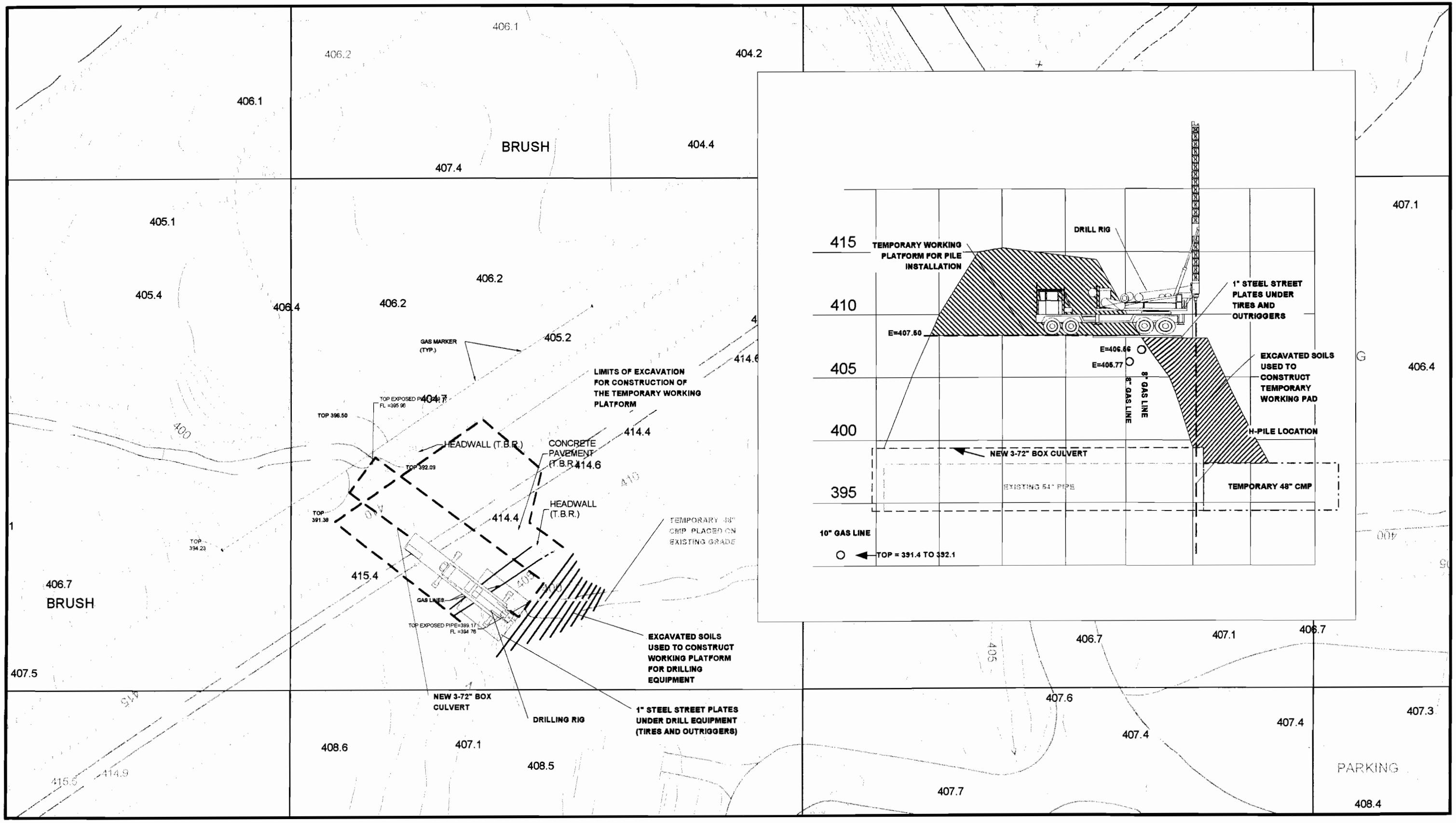
Dead Creek Culvert Replacement

Cahokia, IL

Site Layout

AreaI 001254

Date: July 10, 2000 Sheet: 1 of 4



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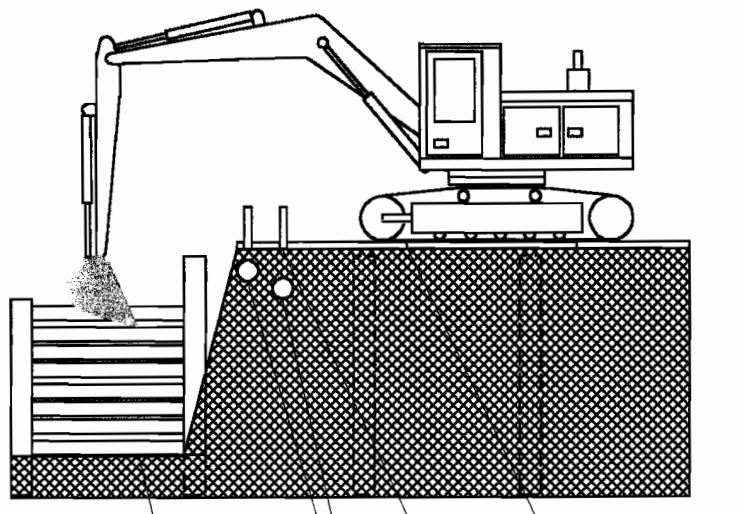
Dead Creek Culvert Replacement

Cahokia, IL

Temporary Working Platform Details

Date: July 10, 2000 Sheet: 2 of 4

Areal 001255

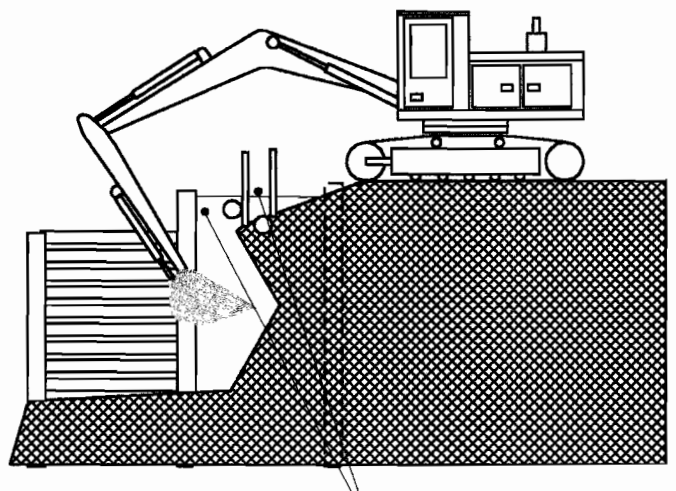


1" STEEL STREET PLATES UNDER EXCAVATOR

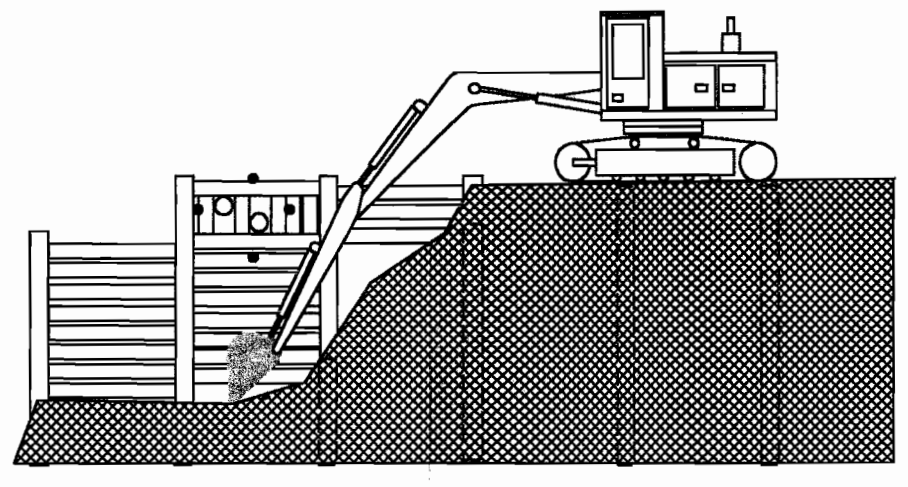
GAS PIPE MARKERS

GAS PIPES

H-PILE AND LAGGING INSTALLED AS EXCAVATION PROGRESSES



SAFETY CABLE WITH FLAGGING INSTALLED AS EXCAVATION PROGRESSES



NOTES

1. THE GAS PIPES SHALL BE LOCATED PRIOR TO ANY INTRUSIVE WORK BY HEAVY EQUIPMENT.

2. A SPOTTER WILL BE PRESENT AT ALL TIMES DURING EXCAVATION IN THE AREA OF THE GAS PIPES.

3. 1" STEEL STREET PLATES WILL BE USED FOR ALL PIPE CROSSINGS

4. THE LARGE EXCAVATOR WILL BE USED UP TO WITHIN 5' OF THE GAS PIPES. THE MINI EXCAVATOR WILL BE USED UP TO WITHIN 1' OF THE GAS PIPES. THE REMAINING 1' OF SOIL WILL BE REMOVED BY HAND.

5. THE SAFETY CABLE WITH FLAGGING WILL BE INSTALLED AS THE EXCAVATION PROGRESSES. THE SAFETY CABLE WILL BE ATTACHED TO THE SHORING SYSTEM AND WILL REMAIN IN PLACE TILL THE EXCAVATION IS BACKFILLED

NOT TO SCALE

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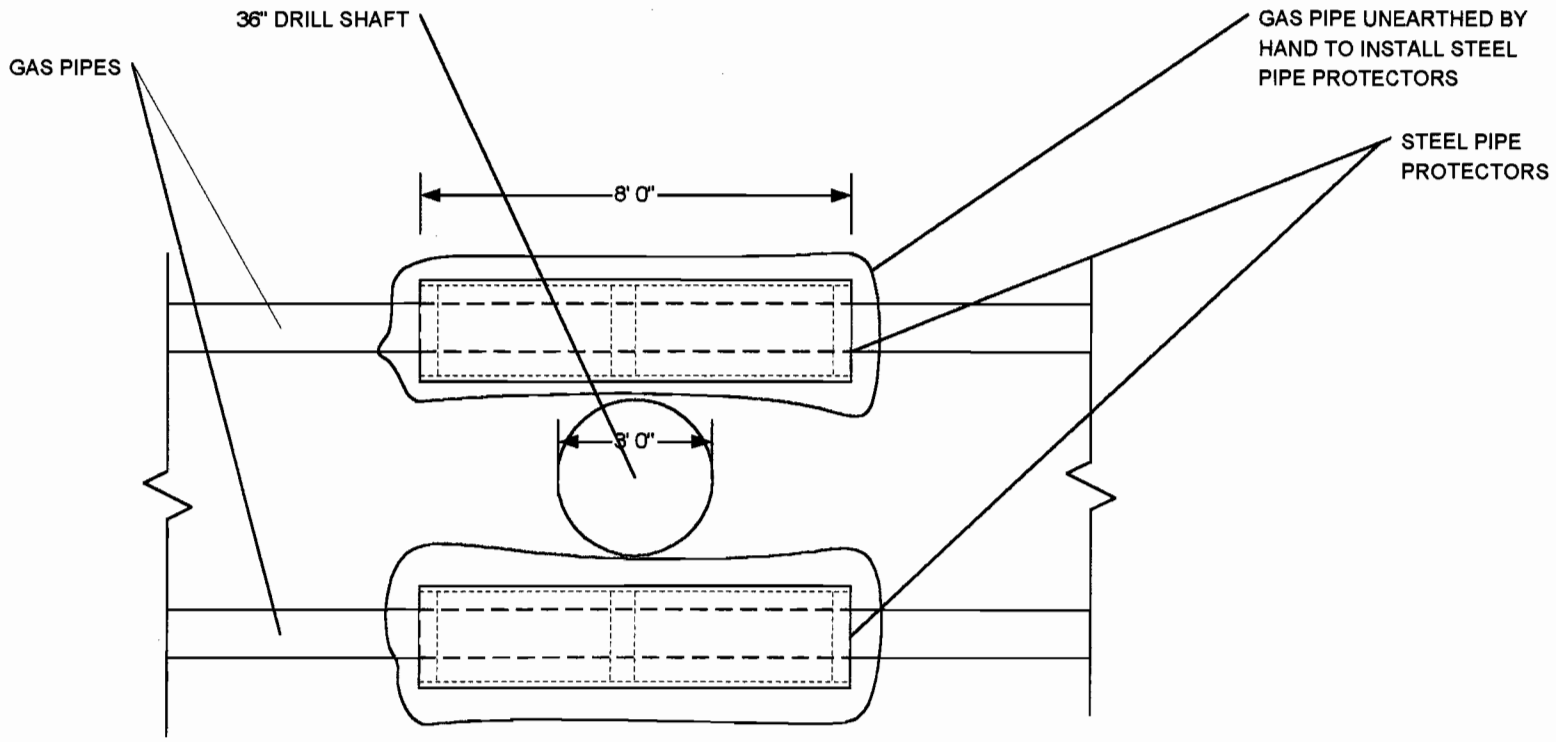
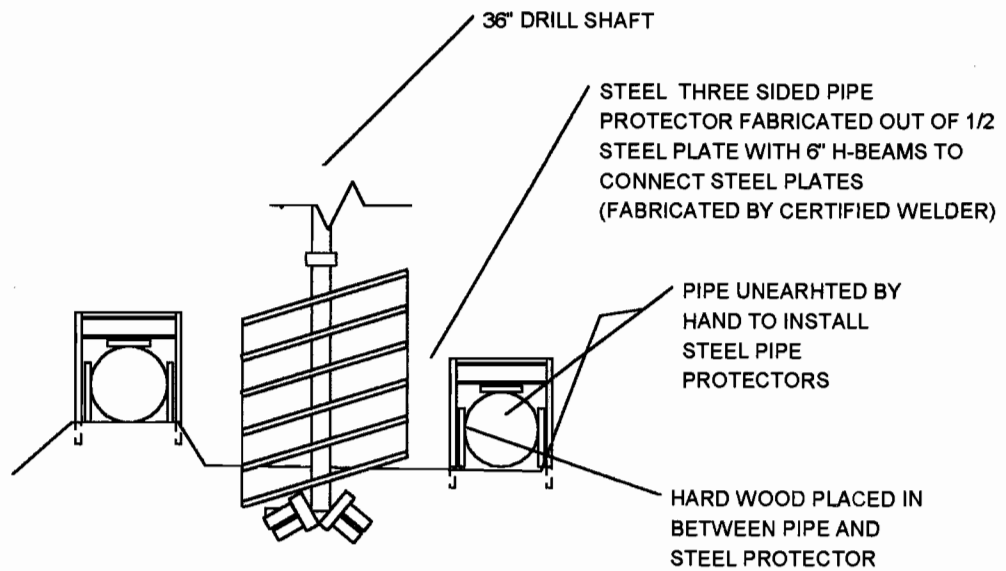
Dead Creek Culvert Replacement

Cahokia, IL
Gas Pipe Excavation AreaI 001256
Date: July 10, 2000 Sheet: 3 of 4





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Dead Creek Culvert Replacement
Cahokia, IL
Gas Pipe Protector Details
Date: July 10, 2000 Sheet: 4 of 4

AreaI 001257

Appendix B

AreaI 001258

Structural Calculations for Cantilever Soldier Pile and Lagging Wall

Objectives:

1.) Support vertical cut adjacent to gas lines for installation of CMP

2.) Support gas lines such that max. unsupported span does not exceed 40 ft.

Assumptions:

1.) Soil profile and properties as shown below.

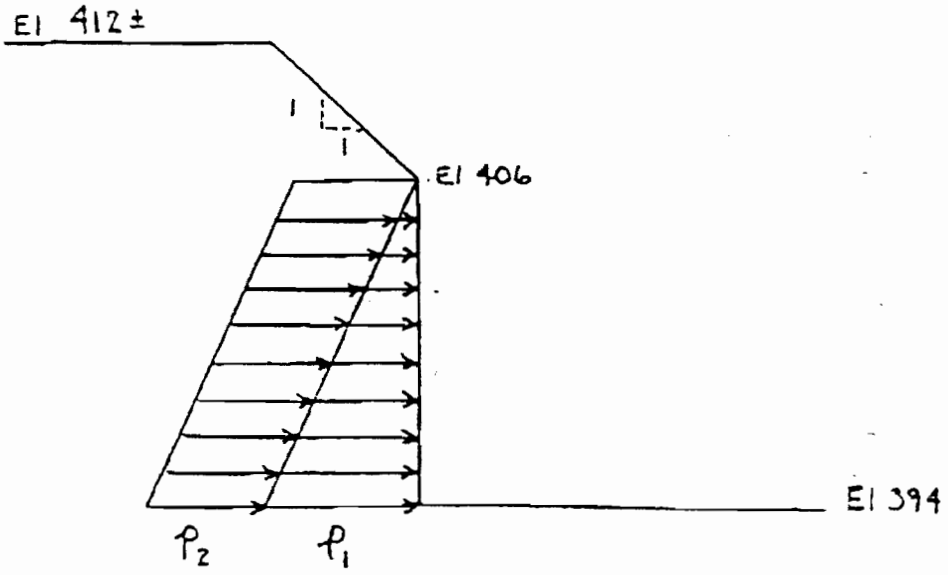
2.) Cut slope geometry of 1H:1V adjacent to shoring to El 406 ±.

3.) Gas lines at an alignment and grade as shown on the attached plans.

Generalized Soil Profile:

_____ El varies	
Firm to stiff silty clay (FILL)	γ_T = 120 pcf S_u = 1000 psf; ϕ' = 30°
_____ El 403 ±	
Firm silty clay (CL) and clay (CH)	γ_T = 115 pcf S_u = 750 psf; ϕ' = 27°
_____ El 383 ±	
▽ El 381 ±	Loose to v. loose sands (SP)

Lateral Earth Pressures



P_1 = active earth pressure due to height of retained soil

P_2 = additional earth pressure due to sloping backfill

$$K_{A_1} = \frac{1-\sin\phi'}{1+\sin\phi'} = \frac{1-\sin 27^\circ}{1+\sin 27^\circ} = 0.375$$

$$\therefore P_1 = 0.375\,(115\text{pcf})(12') = 517.5\text{ psf}$$

$$P_1 = 3105\text{ lb/ft.}$$

$$K_{A_2} = \frac{1-\sin 30^\circ}{1+\sin 30^\circ} = 0.333$$

$$\therefore P_2 = 0.333(120\text{ pcf})(6') = 239.8\text{ psf}$$

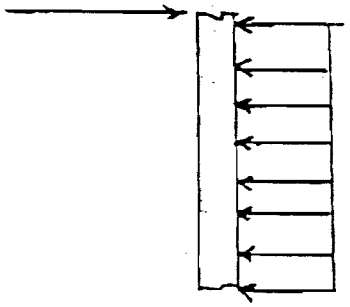
$$P_2 = 2877\text{ lb/ft.}$$

Size Soldier Piles

Assume soldier pile spacing of 6 ft; pile width of 3 ft.

Evaluate passive resistance of toe in accordance w/ Broms (1965); assume undrained soil response controls; neglect active thrust along toe.

$(P_1 + P_2) \cdot 6\,ft = 35{,}892$ lb/pile



$P_p = 9 S_u b = 9(750\,psf)(3\,ft)$
$= 20{,}250$ lb/ft

∴ point of zero shear, $z = 1.77$ ft.

Sum moment about pt. of zero shear,

$$\Sigma M = (3105\,lb/ft)(6ft)(5.77\,ft) + (2877\,lb/ft)(6ft)(7.77\,ft) - (20{,}250\,lb/ft)(1.77\,ft)(0.89\,ft)$$

$$= 209{,}721\ ft\text{-}lb/pile$$

Areal 001261

$$\therefore S_{req'd} = \frac{M_{max}}{\sigma_{allow}} = \frac{(209{,}721)(12)(1/1000)}{25.2\,ksi}$$

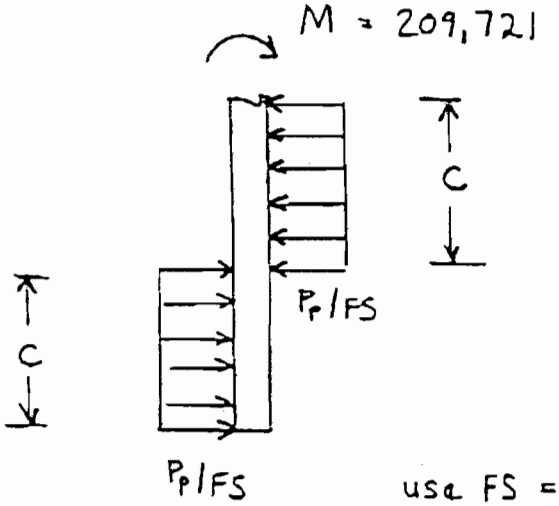
$$= 100\ in^3$$

Made by cgmv Date 3/20/00
Checked by TL Date 3/22/00

FOR Dead Creek Project

Select HP14 x 89

Depth of Toe Penetration



use FS = 1.5

$\therefore P_p/1.5 = 13500$ lb/ft.

$$\Sigma M = 209{,}721 + (13500)(C)(C/2) - (13500)(C)(C/2 + C) = 0$$

$$209721 + 6750C^2 - 6750C^2 - 13500C^2 = 0$$

$$C = 3.94 \text{ ft}$$

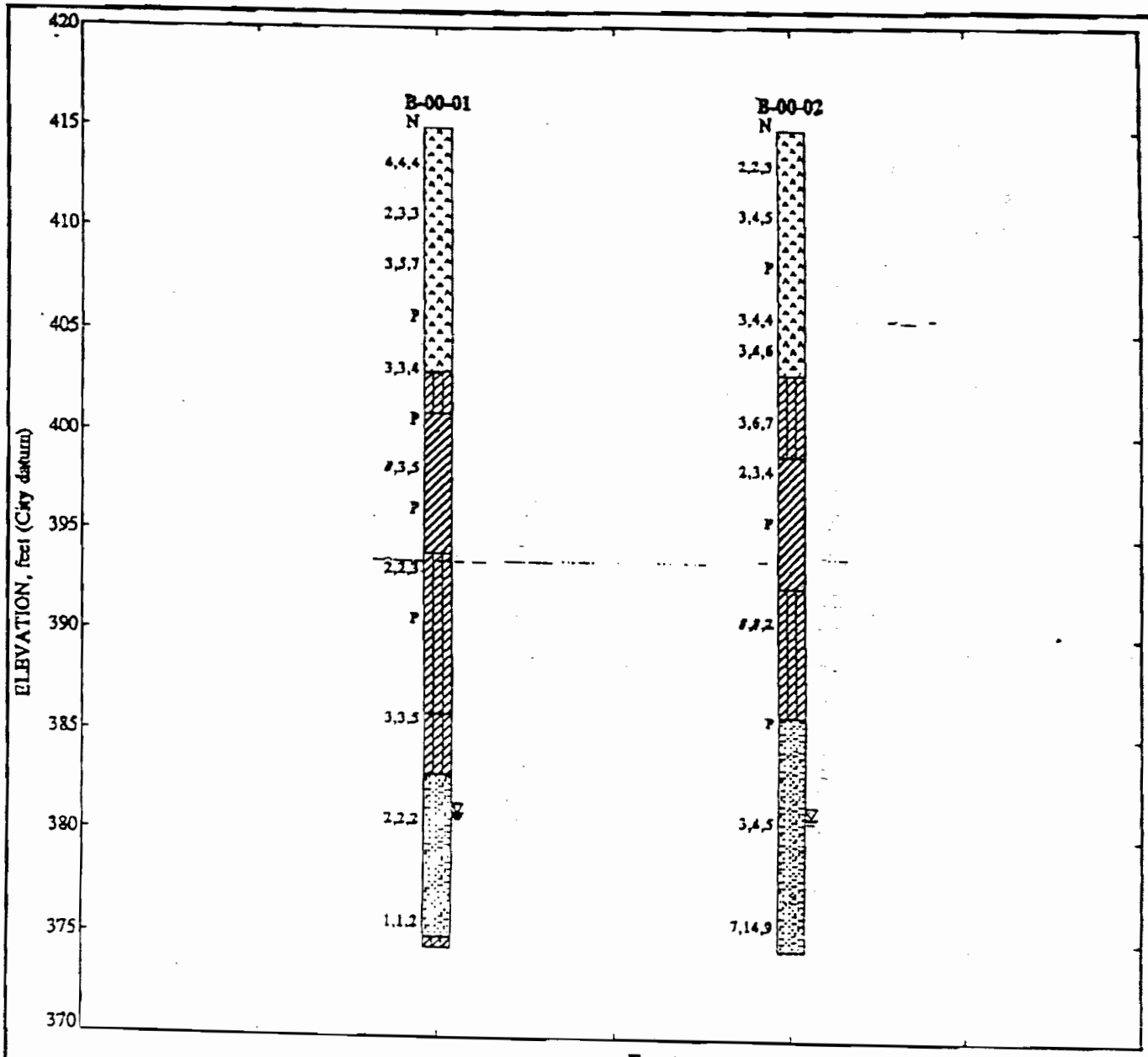
$\therefore$ total depth of penetration

$= 2(3.94') + 1.77' = 9.65'$

say $D = 12'$

TABLE B-1
SUMMARY OF LABORATORY TEST DATA
Solutia-TRRA Culvert 2399STL022.01

BORING NO.	DEPTH (ft)	USC Group Symbol	Water Content (%)	Dry Density (pcf)	LL (%)	PL (%)	Unconf. Strength Qu(ksf)	Strn. (%)	(%) pass 200
B-00-01	3.0	FILL	15						
B-00-01	8.0	FILL	20						
B-00-01	10.5	FILL	11						
B-00-01	13.0				38	20			
B-00-01	15.5	CL	26				1.5	9.6	
B-00-01	18.0	CL	30						
B-00-01	20.5	CL	31				1.2	5.2	
B-00-01	23.0	CL	36						
B-00-01	25.5	CL	50						
B-00-01	30.5	CL	62						
B-00-01	35.5								2.4
B-00-02	8.0	CL	23				3.6	5.7	
B-00-02	13.0	CL	37						
B-00-02	18.0	CH	42		74	23			
B-00-02	20.0		32						
B-00-02	20.5	CH	34	83			2.1	6.7	
B-00-02	25.5	CH	56						
B-00-02	30.5	ML							98.2
B-00-02	35.5	SP							3.6



Legend:

- FILL
- HIGH PLASTIC CLAY
- LOW PLASTIC SITLY CLAY
- SAND

▽ Water level entry at time of drilling

▼ Water level after drilling

P: Hydraulically pushed sample

RQD: Rock Quality Designation

7,10,15: Blows/6" penetration of sampler unless indicated otherwise

N-values equal sum of blows for last 12 inches

NOTE: These graphic logs depict generalized soil conditions. Refer to individual logs for details.

Drawn by: djd	Checked by: gmm	Date: 2/25/00

Solutia-TRRA Culvert, Cahokia, Illinois

Project No. 23995TL022.01

URS Greiner Woodward-Clyde

Graphic Boring Logs

Figure No. 1

Areal 001264

Template: N-TMP108; Proj ID: 02201; Printed: 3/1/00

LOG of BORING No. B-00-02

DATE 2/10/00 SURFACE ELEVATION, FT 415.0 DATUM USGS LOCATION See figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	FIELD Cu,KSF	NMC, %	LL	PI	Cu, KSF	NOTES
0				Crushed rock, cinder, organic material (FILL)									R. Road
		2	56										Boring advanced with 4 1/4in. LD HSA
		2		Firm, moist, brown Silty CLAY (FILL)			0.8						
		3											
		3	56	Stiff, moist, tan, Silty CLAY, roots and									
5		4		vegetation (FILL)			1.0						
		5											
		P		Firm to stiff, dry, tan, Silty CLAY with trace of fine sand (FILL)			1.0						
									23			3.6	
		3	83	Loose, tan, Sandy SILT, roots									
10		4											
		4											
		3	67	Stiff			2.5						
		4											
		6			403.0								
				Stiff, moist, gray, Silty CLAY, (CL)	12.0								Natural soil
									37				
		3	83										
15		6											
		7		Stiff, moist, brown Silty CLAY, red stains									
					399.0								
				Firm, moist, brown, high plasticity CLAY	16.0								
		2	100	(CH): with red stains lens of wet soft clay			2.5						
		3											
		4											
									42	74	51		Water in lens
		P											
20				Firm to stiff, brown, high plasticity CLAY (CH)					32				
									34			2.1	
					392.5								
				Soft, dark gray, Silty CLAY, (CL) lens of wet sand	22.5								
		#	100										

Completion Depth: 40.5 Ft.

Project No.: 2399STL022.01

Project Name: Solutia-TRRA Culvert

Drilling Contractor: Harris Drilling

Water Depth: 34 ft., After ATD hrs.

____ ft., After ____ hrs.

____ ft., After ____ hrs.

Logged by: RGF

3/1/00 WCCXS 02201

URS Greiner Woodward-Clyde

LOG of BORING No. B-00-02

DATE 2/10/00 SURFACE ELEVATION, FT 415.0 DATUM USGS LOCATION See figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25		#		Soft, wet, dark gray Silty CLAY (CL);									Water in sand lens
		2		with lens of sand					56				
					386.0								
		P	67		29.0								
30				Loose, medium coarse SAND (SP); with silt									(1) tube (1) jar no California tube lids
				Loose, wet, medium coarse SAND (SP); with silt									
		3	78	▽									Water table
35		4											
		5											
													Water added to boring, no loss of hole
		7	33										
		14											
40		9		Medium dense, poorly graded, fine SAND (SP)	374.5								
				Bottom of boring at 40.5ft.	40.5								Boring backfilled with cuttings
45													

Completion Depth: 40.5 Ft.

Project No.: 2399STL022.01

Project Name: Soluția-TRRA Culvert

Drilling Contractor: Harris Drilling

Water Depth: 34 ft., After ATD hrs.

____ ft., After ____ hrs.

____ ft., After ____ hrs.

Logged by: RGF

3/1/00 WCOLS 02201

URS Greiner Woodward-Clyde

LOG of BORING No. B-00-01

Sheet 1 of 2

DATE 2/10/00 SURFACE ELEVATION, FT 415.0 DATUM USGS LOCATION See figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	FIELD Qu,KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Crush rock, cinder, silty clay, vegetation (FILL)									RRoad bed
		4	67										Boring advanced with 4 1/4in. I.D HSA
		4											
		4		Stiff, moist, light tan, fine Sandy Clayey SILT (FILL)					24	56	40		
									15				
		2	83	Becomes firm									
5		3											
		3											
		3	67										
		5		Becomes stiff									Dry & friable
		7											
									20				
		P	89										
10													
									1:				
		3	100		403.1								
		3		Firm, moist, light brown, Silty CLAY (CL)	11.9								
		4											
					401.0					38	18		
		P	67		14.0		2.0						
15				Firm, moist, brown, moist, high plasticity CLAY (CH)									
									26			1.5	
		#	67				1.5						
		3											
		5											
		P	78				2.0		30				
20				Firm, moist, dark gray, brown, high plasticity CLAY (CH); with lens of wet sand									Water in lens
					394.0				31			1.2	
		2	100	Firm, moist, dark gray, Silty CLAY (CL); with red stains and fine sand, trace mica	21.0								
		2											
		3											
									36				
		P	100										

Completion Depth: 40.5 Ft.

Project No.: 2399STL022.01

Project Name: Soluria-TRRA Culvert

Drilling Contractor: Harris Drilling

Water Depth: 34 ft., After ATD hrs.

____ ft., After ____ hrs.

____ ft., After ____ hrs.

Logged by: RGF

3/1/00 WCCXS 02201

URS Greiner Woodward-Clyde

LOG of BORING No. B-00-01

Sheet 2 of 2

DATE 2/10/00 SURFACE ELEVATION, FT 415.0 DATUM USGS LOCATION See figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25				Firm, moist, dark gray Sandy Silty CLAY (CL)					50				
					386.0								
		3	67	Firm to stiff, wet dark gray, Silty CLAY	29.0								
30		3		(CL)									
		5							62				
					383.0								
				loose, wet, medium coarse SAND (SP)	32.0								
		2	78	▽									
35		2											
		2											Water added to boring, no blow in No drilling mud added
													Back into a stiff clay bottom 6in. of SP sample
		1	100	Becomes very loose									
		1			375.0								
40		2		Stiff, dark gray Silty CLAY (CL)	40.0								
				Bottom of boring at 40.5ft.	374.5								Backfilled boring with cuttings
					40.5								
45													

Completion Depth: 40.5 Ft.

Project No.: 2399STL022.01

Project Name: Solutia-TRRA Culvert

Drilling Contractor: Harris Drilling

Water Depth: 34 ft., After ATD hrs.

____ ft., After ____ hrs.

____ ft., After ____ hrs.

Logged by: RGF

3/1/00 WCCX$ 02201

URS Greiner Woodward-Clyde

Appendix C

302.5
Mini Hydraulic Excavator

CAT®

Areal 001270

Cat® 3013 Naturally Aspirated Diesel Engine		
Flywheel Power	18.0 kW	24.1 hp
Operating Weight:		
With cab	2734 kg	6015 lb
With canopy	2619 kg	5762 lb

Engine

Caterpillar 3013 naturally aspirated, watercooled, 4-stroke, 3-cylinder diesel engine.

The following ratings apply at 2300 rpm when tested under the specific standard conditions for the specified standard:

Gross power	kW	hp
SAE J1995	18.0	24.1

Net power	kW	hp	PS
Caterpillar	17.1	22.9	—
ISO 9249	17.1	22.9	—
SAE J1349	17.1	22.9	—
EEC 80/1269	17.1	22.9	—
DIN 70020	—	—	23.2

Dimensions

Bore	84 mm	3.31"
Stroke	90 mm	3.54"
Displacement	1496 cm^3	91.3 in^3

Undercarriage

H-shaped, fabricated frame.

- Fabricated design gives high durability
- Tapered roller frame reduces accumulation of material in the tracks
- Track tension adjustment is accomplished through grease-filled cylinders
- Trackshoe width is 300 mm (12") for both standard rubber and optional steel shoes
- Ground clearance is 310 mm (12.2")
- Three bottom rollers and one carrier roller on each side

Swing System

Hydraulic motor-driven.

- Automatic swing brake, spring applied, hydraulic release
- Centralized lubrication

Machine swing speed	9.0 rpm

Boom swing system with cast swing post:

Left (without stop)	90°
Left (with stop)	55°
Right	50°

Weights

With rubber tracks, bucket, operator, full fuel and auxiliary lines.
(Weight varies depending on machine configuration. Please refer to Operation & Maintenance Manual).

Cab	2734 kg	6015 lb
Canopy	2619 kg	5762 lb

Service Refill Capacities

	liters	gallons
Cooling system TAG	4.2	1.1
Engine oil	5.7	1.5
Fuel tank	41.5	10.8
Hydraulic tank	36	9.4
Hydraulic system	50	13

Travel System

Travel speed:		
High	4.5 km/h	2.8 mph
Low	2.5 km/h	1.6 mph

Max traction force:		
High	11 kN	2475 lb
Low	22 kN	4950 lb
Gradeability (max):		
High		31°
Low		37°

- Each track is driven by one independent two-speed motor
- Drive modules are integrated into the roller frame for total protection
- Straight line travel when tracking and operating the front linkage simultaneously

Sound Levels

Operator sound pressure level is 83 dbA for cab and 82 dbA for canopy equipped machines when measured per ISO 6396 (dynamic) or 95/27/EC.

Electrical System

12-volt system.

- 55-amp alternator
- 12-volt, 500 CCA, 53 amp/hr maintenance free battery
- Sealed electrical connectors

Blade

Blade is full width of the machine.

Width	1450 mm	57.0"
Height of blade	350 mm	13.8"
Dig depth	290 mm	11.4"
Lift height	320 mm	12.6"

Hydraulic System

Areal 001271

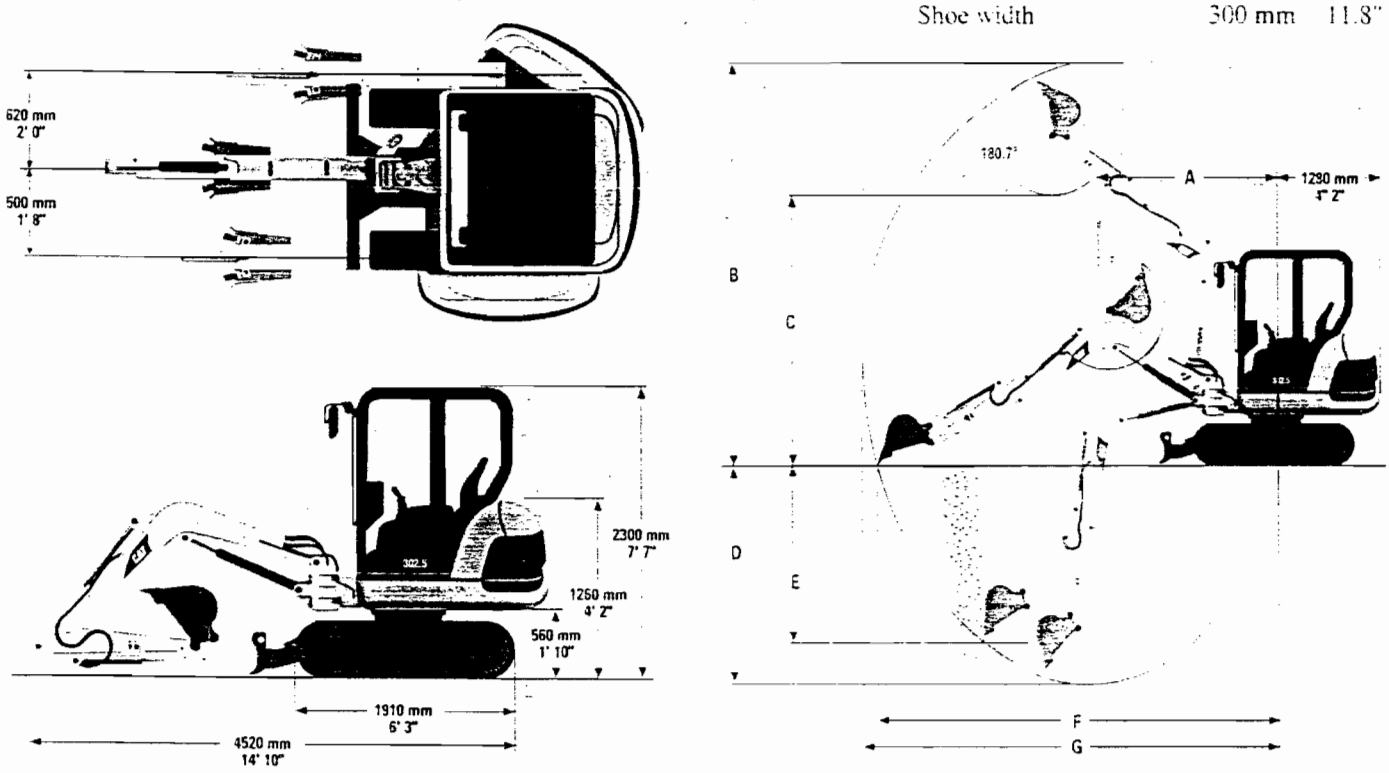
- Auxiliary valve, lines to the swing post and foot pedal are standard
- Optional auxiliary hydraulic lines are available
- Secondary optional auxiliary line uses the bucket cylinder hydraulic circuit
- Boom, stick, bucket and machine swing are pilot-controlled

Pumps: two piston, one gear-type (max delivery):		
Piston	2 x 33.3 lpm	2 x 8.7 gpm
Gear	19 lpm	4.9 gpm
Operating pressures:		
Equipment	206 bar	2987 psi
Travel	206 bar	2987 psi
Swing	172 bar	2494 psi
Auxiliary circuit (max. delivery)	52 lpm at 172 bar	13.5 gpm at 2494 psi
Digging forces:		
Stick (standard)	1420 kgf	3124 lb
Stick (long)	1211 kgf	2665 lb
Bucket	2240 kgf	4928 lb

Dimensions

(approximate)

Track and blade width	1140 mm	44.9"
Gauge width	1150 mm	45.3"
Shoe width	300 mm	11.8"



	A	B	C	D	E	F	G
Standard stick	1895 mm 6' 3"	4380 mm 14' 4"	3100 mm 10' 2"	2650 mm 8' 8"	2120 mm 6' 11"	4560 mm 15'	4670 mm 15' 4"
Long stick	1910 mm 6' 3"	4520 mm 14' 10"	3250 mm 10' 8"	2950 mm 9' 8"	2380 mm 7' 10"	4830 mm 15' 10"	4930 mm 16' 2"

Standard Equipment

Standard equipment may vary.
Consult your Caterpillar dealer for specifics.

Alternator, 55-amp
Automatic swing parking brake
Auxiliary hydraulic PTO with valve, controls and lines to the swing post
Boom cylinder guard
Canopy with FOPS per ISO 10262 Level I and TOPS per ISO 12117
Coat hook
Dozer blade
Floor mat
Gauges or indicators for fuel level, engine coolant temperature, hour meter, engine oil pressure, air cleaner, alternator and glow plugs
Horn
Hydraulic oil cooler
Lockable fuel cap
Lockable storage box
Low maintenance linkage pin joints
Maintenance-free battery
Rubber track, 300 mm (12 in)
Seatbelt, 50 mm (2 in)
Static, vinyl covered seat
Two-speed travel
Wrist rests

Areal 001272

Optional Equipment

Optional equipment may vary. Consult your Caterpillar dealer for specifics.

Auxiliary hydraulic lines, front linkage
Boom check valve
Cab, fully glazed with FOPS per ISO 10262 Level 1, TOPS per ISO 12117, heater/defroster, interior light and windshield wiper/washer
Control pattern changer
Foot travel pedals
FOPS per ISO 10262 Level II
Front screen for cab and canopy
Lights, cab mounted and boom mounted
Long stick
Mechanical Quick Coupler
Mirrors, for cab or canopy
Radio installation kit
Suspension seat, vinyl or fabric
Tool kit
Travel alarm

atlantic equipment company inc.

MANUFACTURER OF

FOUNDATION DRILLING MACHINES
TIE-BACK EQUIPMENT
FOUNDATION DRILLING TOOLS
CONTINUOUS AUGERS

TEL. 703-754-7114
8 AM-4 PM EST P.O. BOX 10 GAINESVILLE, VIRGINIA 22065 FAX 703-754-7437

Weights and Dimensions

	LLDH 80		LLDH 100		LLDH 110		LLDH 120	
	lbs	kg	lbs	kg	lbs	kg	lbs	kg
TOTAL	84,300	38 238	85,830	38 932	86,550	39 259	87 350	39 622
FRONT TANDEM	30,700	13 925	35,450	16 080	37,500	17 010	40,180	18 226
REAR TANDEM	53,600	24 313	50,380	22 852	49,050	22 249	47,170	21 396
DERRICK	18,600	8 437	20,100	9 117	20,900	9 435	21 500	9 798
DRAWWORKS W/T. T. & JACKS	36,200 lbs 16 420 kg							
CARRIER (PURCHASED)	24,729 lbs 11 217 kg							

Weights are approximate and will vary with equipment provided.

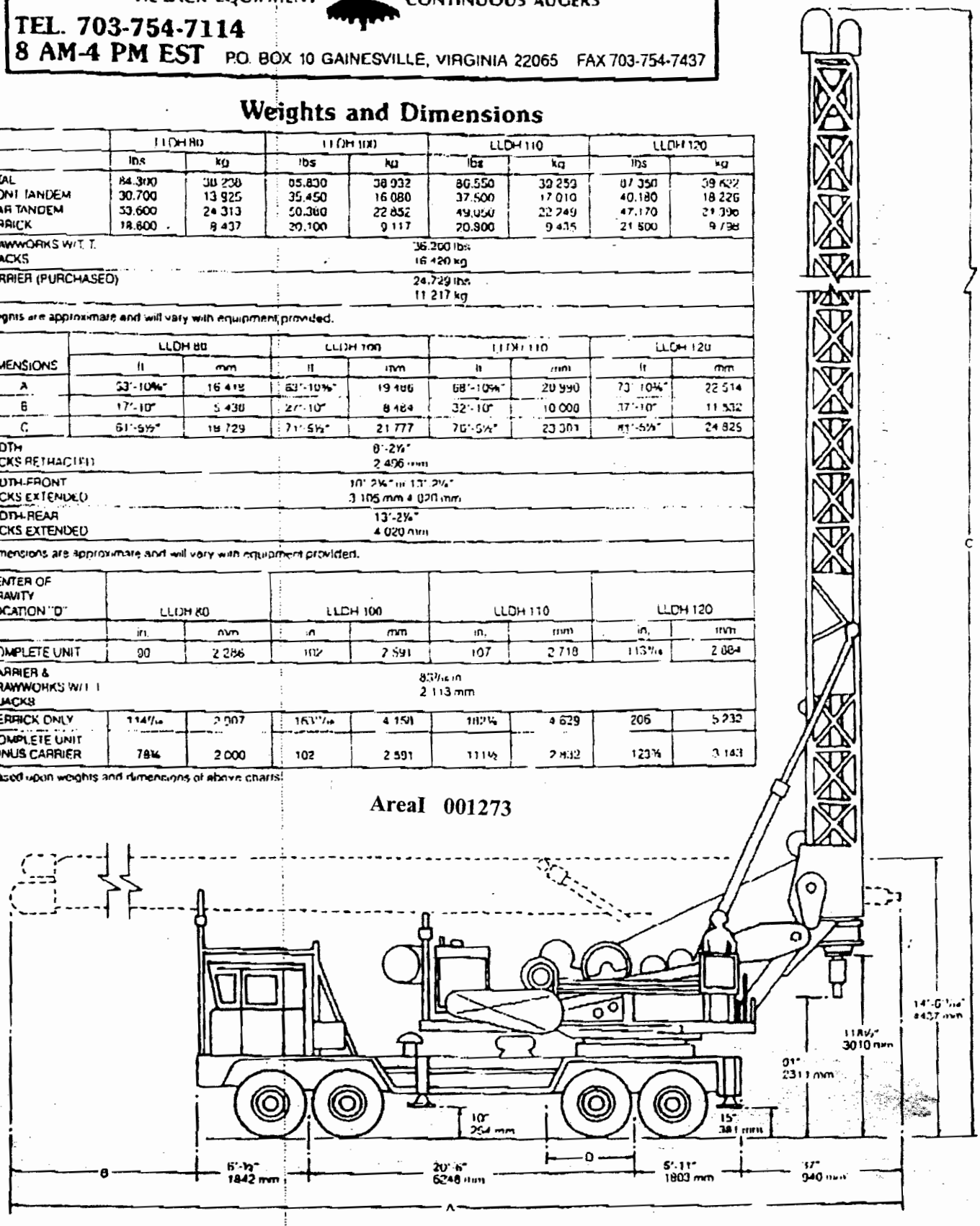
DIMENSIONS	LLDH 80		LLDH 100		LLDH 110		LLDH 120	
	ft	mm	ft	mm	ft	mm	ft	mm
A	53'-10⅝"	16 419	63'-10⅝"	19 466	68'-10⅝"	20 990	73'-10⅝"	22 514
B	17'-10"	5 430	27'-10"	8 484	32'-10"	10 000	37'-10"	11 532
C	61'-5½"	18 729	71'-5½"	21 777	76'-5½"	23 301	81'-5½"	24 825
WIDTH JACKS RETRACTED	8'-2⅛" 2 496 mm							
WIDTH-FRONT JACKS EXTENDED	10'-2⅛" to 13'-2⅛" 3 105 mm to 4 020 mm							
WIDTH-REAR JACKS EXTENDED	13'-2⅛" 4 020 mm							

Dimensions are approximate and will vary with equipment provided.

CENTER OF GRAVITY LOCATION "D"	LLDH 80		LLDH 100		LLDH 110		LLDH 120	
	in.	mm	in	mm	in.	mm	in.	mm
COMPLETE UNIT	90	2 286	102	2 591	107	2 718	113⅛	2 864
CARRIER & DRAWWORKS W/T. T. & JACKS	83⅛ in 2 113 mm							
DERRICK ONLY	114⅛	2 907	163⅞	4 159	182¼	4 629	206	5 232
COMPLETE UNIT MINUS CARRIER	78¼	2 000	102	2 591	111½	2 832	123⅛	3 143

Based upon weights and dimensions of above charts.

Areal 001273



Appendix D

INDEPENDENT CONCRETE PIPE CONCRETE
(MISSOURI DIVISION)
12950 GRAVOIS RD.
ST. LOUIS, MO. 63127
(314) 842-2900

Contractor: Maverick Construction Management Services, Inc.

Project: Solutia – TRRA Over Dead Creek

Item: 6' x 6' Box Culvert, C-789 – 13'- 14' Cover HS-20 LD

This is to certify that the Reinforced Concrete Box Culvert we purpose to furnish for the above project meets the specifications of ASTM C-789 HS-20 Loading.

* This meets the requirements of Illinois Department of Transportation.

Ronald F. Green

Ron Green,
Plant Manager

Areal 001275

☐ FURNISH AS SUBMITTED ☐ REVISE AND RESUBMIT
☐ REJECTED ☐ SUBMIT SPECIFIED ITEM
☒ FURNISH AS CORRECTED

CORRECTIONS OR COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DO NOT RELIEVE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THIS CHECK IS ONLY FOR REVIEW OF GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS, SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATING HIS WORK WITH THAT OF ALL OTHER TRADES, AND PERFORMING HIS WORK IN A SAFE AND SATISFACTORY MANNER.

WVP CORPORATION
Engineers Architects Planners

Date 06-23-00 By David Budnik

INDEPENDENT CONCRETE PIPE COMPANY

MISSOURI DIVISION

(314) 842-2900
FAX (314) 842-5869

MANUFACTURERS OF:
REINFORCED CONCRETE PIPE, BOX CULVERTS AND MANHOLES

June 20, 2000

Maverick Construction Management Services, Inc.
C/O John Fiore
PO Box 60700
King of Prussia, PA. 19406

John,

Included is C-789 specification on page 177 Fig. 1 shows the wire layout that we certify to build our reinforced concrete boxes. On the bottom of page 177 Fig. 2 you can see the 5" spigot on the inner and outer cage. In regards to an Engineers seal we don't normally do that, however we are an IDOT approved plant to manufacture concrete pipe and reinforced concrete boxes.

Tony Russo

Tony Russo

Independent Concrete Pipe

Areal 001276

Designation: C 789 – 95a

Areal 001277

Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers[1]

This standard is issued under the fixed designation C 789; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers single-cell precast reinforced concrete box sections intended to be used for the construction of culverts and for the conveyance of storm water, industrial wastes, and sewage.

1.2 A complete metric companion to Specification C 789 has been developed—C 789M; therefore, no metric equivalents are presented in this specification.

NOTE 1—This specification is primarily a manufacturing and purchasing specification. However, standard designs are included and the criteria used to develop these designs are given in the Appendixes. The successful performance of this product depends upon the proper selection of the box section, bedding, backfill, and care that the installation conforms to the construction specifications. The owner of the precast reinforced concrete box sections specified herein is cautioned that he must properly correlate the loading conditions and the field requirements with the box section specified and provide for inspection at the construction site.

NOTE 2—Specification C 850 is to be used for box sections with less than 2 ft of cover subjected to highway loading.

2. Referenced Documents

2.1 *ASTM Standards:*

A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement[2]

A 185 Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement[2]

A 496 Specification for Steel Wire, Deformed, for Concrete Reinforcement[2]

A 497 Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement[2]

C 31 Practice for Making and Curing Concrete Test Specimens in the Field[3]

C 33 Specification for Concrete Aggregates[3]

C 39 Test Method for Comprehensive Strength of Cylindrical Concrete Specimens[3]

C 150 Specification for Portland Cement[4]

C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete[3]

C 497 Test Methods for Concrete Pipe, Manhole Sections, or Tile[5]

C 595/C 595M Specification for Blended Hydraulic Cements[4]

C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete[3]

C 822 Terminology Relating to Concrete Pipe and Related Products[5]

C 850 Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with Less Than 2 ft of Cover Subjected to Highway Loadings[5]

C 1116 Specification for Fiber-Reinforced Concrete and Shotcrete[3]

2.2 *AASHTO Standard:*

Specifications for Highway Bridges, 1973 Edition[6]

2.3 *ACI Code:*[7]

ACI 318-71 Building Code, 1971 edition

3. Terminology

3.1 *Definitions*—For definitions of terms relating to concrete pipe, see Terminology C 822.

4. Types

4.1 Precast reinforced concrete box sections manufactured in accordance with this specification shall be of three types identified in Tables 1, 2, and 3 and shall be designated by type, span, rise, and design earth cover.

5. Basis of Acceptance

5.1 Acceptability of the box sections produced in accordance with Section 7 shall be determined by the results of the concrete compressive strength tests described in Section 10, by the material requirements described in Section 6, and by inspection of the finished box sections.

5.2 Box sections shall be considered ready for acceptance when they conform to the requirements of this specification.

6. Materials

6.1 *Reinforced Concrete*—The reinforced concrete shall consist of cementitious materials, mineral aggregates and water, in which steel has been embedded in such a manner that the steel and concrete act together.

6.2 *Cementitious Materials:*

6.2.1 *Cement*—Cement shall conform to the require-

[1] This specification is under the jurisdiction of ASTM Committee C-13 on Concrete Pipe and is under the direct responsibility of Subcommittee C13.07 on Acceptance Specifications and Precast Concrete Box Sections.

Current edition approved Oct. 10, 1995. Published February 1996. Originally published as C 789 – 74. Last previous edition C 789 – 95.

[2] *Annual Book of ASTM Standards*, Vol 01.04.

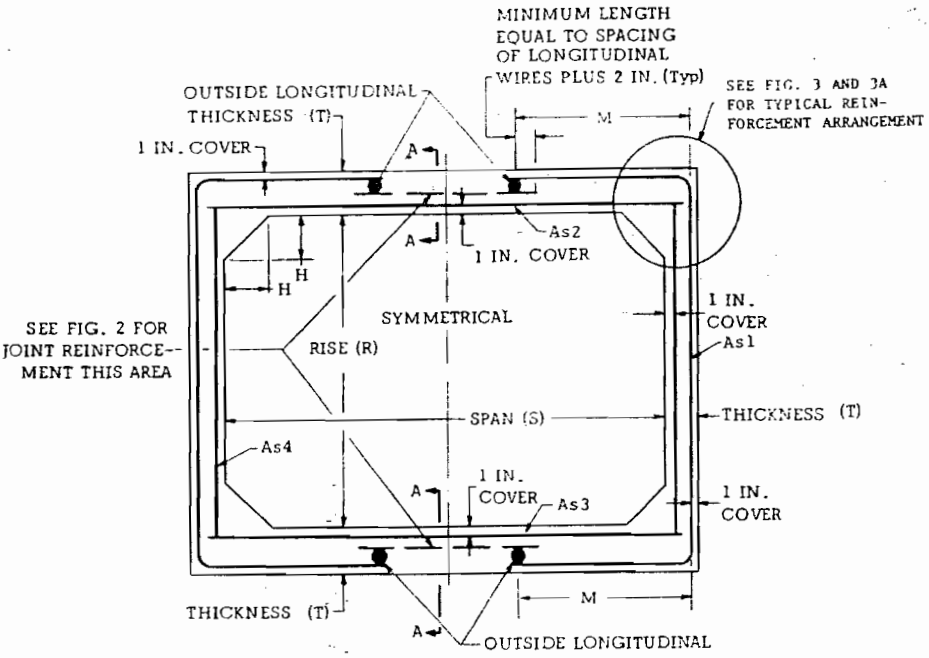
[3] *Annual Book of ASTM Standards*, Vol 04.02.

[4] *Annual Book of ASTM Standards*, Vol 04.01.

[5] *Annual Book of ASTM Standards*, Vol 04.05.

[6] Available from American Association for State Highway Transportation Officials, 444 N Capitol, Washington, DC 20001.

[7] Available from the American Concrete Institute, P.O. Box 19150, Detroit, MI 48219.



NOTE 1—The dimension *M* is the total of the theoretical cut-off length plus the required anchorage.
NOTE 2—The haunch dimension *H* is equal to the thickness *T*.

FIG. 1 Typical Box Section

ments for portland cement of Specification C 150 or shall be portland blast-furnace slag cement or portland-pozzolan cement conforming to the requirements of Specification C 595/C 595M, except that the pozzolan constituent in the Type IP portland pozzolan cement shall be fly ash and shall not exceed 25 % by weight.

6.2.2 *Fly Ash*—Fly ash shall conform to the requirements of Specification C 618, Class F or Class C.

6.2.3 *Allowable Combinations of Cementitious Materials*—The combination of cementitious materials used in concrete shall be one of the following:

6.2.3.1 Portland cement only.

6.2.3.2 Portland blast furnace slag cement only.

6.2.3.3 Portland pozzolan cement only.

6.2.3.4 A combination of portland cement and fly ash wherein the proportion of fly ash is between 5 and 25 % by weight of total cementitious material (portland cement plus fly ash).

6.3 *Aggregates*—Aggregates shall conform to Specification C 33, except that the requirements for gradation shall not apply.

6.4 *Admixtures and Blends*—Admixtures and blends may be used with the approval of the owner.

6.5 *Steel Reinforcement*—Reinforcement shall consist of welded wire fabric conforming to Specifications A 185 or A 497.

6.6 *Synthetic Fibers*—Collated fibrillated virgin polypropylene fibers may be used, at the manufacturer's option, in concrete pipe as a nonstructural manufacturing material. Only Type III synthetic fibers designed and manufactured specifically for use in concrete and conforming to the requirements of Specification C 1116 shall be accepted.

7. Design

7.1 *Design Tables*—The box section dimensions, compressive strength of the concrete, and reinforcement details

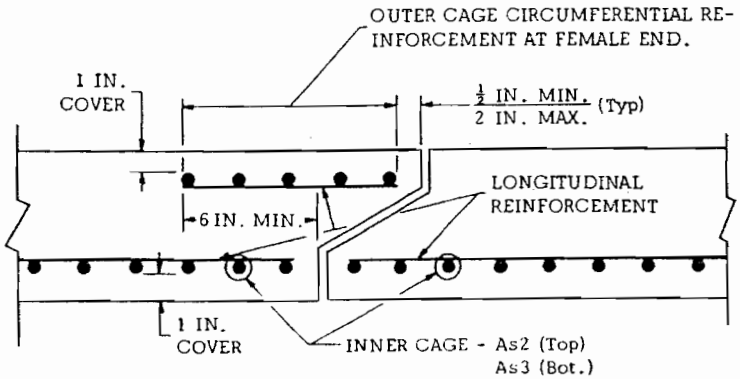


FIG. 2 Section A-A Top and Bottom Slab Joint Reinforcement

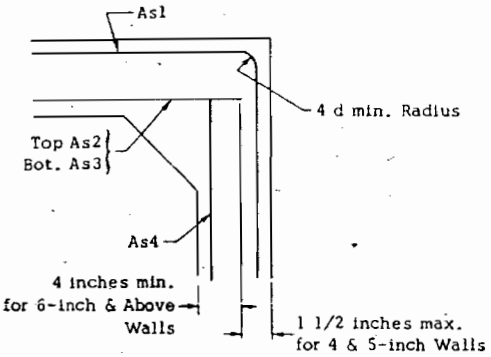


FIG. 3 Detail Inner Reinforcement

shall be as prescribed in Tables 1, 2, or 3 and Figs. 1, 2, and 3, subject to the provisions of Section 11. Table 1 sections are designed for combined earth dead load and AASHTO HS20 live load conditions. Table 2 sections are designed for combined earth dead load and Interstate live load conditions when the Interstate live loading exceeds the HS20 live loading. Table 3 sections are designed for earth dead load conditions only. Criteria used to develop Tables 1, 2, and 3 are given in Appendix X1. For modifications to the designs shown in Tables 1, 2, and 3 due to anticipated earth and surcharge loads different from those used to develop the tables, see Appendix X2.

7.2 *Modified and Special Designs*—The manufacturer may request approval by the owner of modified designs which differ from the designs in Section 7; or special designs for sizes and loads other than those shown in Tables 1, 2, and 3.

NOTE 3—The tabular designs in this specification were prepared according to AASHTO Standard Specifications for Highway Bridges, 1973 Edition. The current Specifications for Highway Bridges allows concrete shear stress criteria that differs from the 1973 criteria. The use of current AASHTO concrete shear stress criteria shall be acceptable by this specification for modified or special designs.

7.3 *Placement of Reinforcement*—The cover of concrete over the circumferential reinforcement shall be 1 in., subject to the provisions of Section 11. The inside circumferential reinforcement shall extend into the male portion of the joint, and the outside circumferential reinforcement shall extend into the female portion of the joint. The clear distance of the end circumferential wires shall be not less than ½ in. nor more than 2 in. from the ends of the box section. Reinforcement shall be assembled utilizing any combination of single or multiple layers of welded-wire fabric. A common reinforcement unit may be utilized for both A_{s2} (or A_{s3}) and A_{s4}, with the largest area requirement governing, bending the reinforcement 90° at the corners and waiving the extension requirements of Fig. 3. See Fig. 3A. The welded-wire fabric shall be composed of circumferential and longitudinal wires meeting the spacing requirements of 7.4 and shall contain sufficient longitudinal wires extending through the box section to maintain the shape and position of reinforcement. The exposure of the ends of longitudinals, stirrups, and spacers used to position the reinforcement shall not be a cause for rejection.

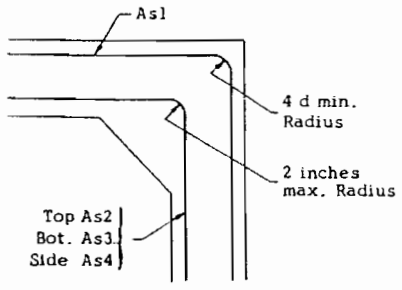


FIG. 3A Detail Option

7.4 *Laps, Welds, and Spacing*—Splices in the circumferential reinforcement shall be made by lapping. The overlap measured between the outermost longitudinal wires of each fabric sheet shall not be less than the spacing of the longitudinal wires plus 2 in. If A_{s1} is extended and connected, welded splices shall be allowed in the connection. A_{s4} may be lapped and welded at any location or connected by welding at the corners to A_{s2} and A_{s3}. The spacing center to center of the circumferential wires shall not be less than 2 in. nor more than 4 in. The spacing center to center of the longitudinal wires shall not be more than 8 in.

8. Joints

8.1 The precast reinforced concrete box sections shall be produced with male and female ends. The ends shall be of such design and the ends of the box sections so formed that the sections can be laid together to make a continuous line of box sections compatible with the permissible variations given in Section 11.

8.2 Outer cage circumferential reinforcement as shown in Figs. 1 and 2 shall be placed in the top and bottom slabs at the female portion of the joint when A_{s1} is not continuous over the span. The minimum area of such reinforcement in square inches per linear foot of box section length shall be the same as the areas specified for A_{s4} in Tables 1, 2, and 3.

9. Manufacture

9.1 *Mixture*—The aggregates shall be sized, graded, proportioned, and mixed with such proportions of cementitious materials and water as will produce a homogeneous concrete mixture of such quality that the pipe will conform to the test and design requirements of this specification. All concrete shall have a water-cementitious materials ratio not exceeding 0.53 by weight. Cementitious materials shall be as specified in 6.2 and shall be added to the mix in a proportion not less than 470 lb/yd^3 unless mix designs with a lower cementitious materials content demonstrate that the quality and performance of the pipe meet the requirements of this specification.

9.2 *Curing*—The box sections shall be cured for a sufficient length of time so that the concrete will develop the specified compressive strength in 28 days or less. Any one of the following methods of curing or combinations thereof may be used:

9.2.1 *Steam Curing*—The box sections may be low pressure, steam-cured by a system that will maintain a moist atmosphere.

9.2.2 *Water Curing*—The box sections may be water-cured by any method that will keep the sections moist.

9.2.3 *Membrane Curing*—A sealing membrane con-

forming to the requirements of Specification C 309 may be applied and shall be left intact until the required concrete compressive strength is attained. The concrete temperature at the time of application shall be within 10°F of the atmospheric temperature. All surfaces shall be kept moist prior to the application of the compounds and shall be damp when the compound is applied.

9.3 *Forms*—The forms used in manufacture shall be sufficiently rigid and accurate to maintain the box section dimensions within the permissible variations given in Section 11. All casting surfaces shall be of smooth nonporous material.

9.4 *Handling*—Handling devices or holes shall be permitted in each box section for the purpose of handling and laying.

10. Physical Requirements

Concrete Testing

10.1 *Type of Specimen*—Compression tests for determining concrete compressive strength may be made on either concrete cylinders or on cores drilled from the boxed section.

10.2 *Compression Testing of Cylinders:*

10.2.1 *Cylinder Production*—Cylinders shall be prepared in accordance with the Cylinder Strength Test Method of Test Methods C 497.

10.2.2 *Number of Cylinders*—Prepare not fewer than five test cylinders from a group (one day's production) of box sections.

10.2.3 *Acceptability on the Basis of Cylinder Test Results:*

10.2.3.1 When the compressive strengths of all cylinders tested for a group are equal to or greater than the design concrete strength, the compressive strength in the group of box sections shall be accepted.

10.2.3.2 When the average compressive strength of all cylinders tested is equal to or greater than the design concrete strength, not more than 10 % of the cylinders tested have a compressive strength less than the design concrete strength, and no cylinder tested has a compressive strength less than 80 % of the design concrete strength, then the compressive strength of the concrete in the group of box sections shall be accepted.

10.2.3.3 When the compressive strength of the cylinders tested does not conform to the acceptance criteria stated in 10.2.3.1 or 10.2.3.2, the acceptability of the group shall be determined in accordance with the provisions of 10.2.

10.3 *Compression Testing of Cores:*

10.3.1 *Obtaining Cores*—Cores shall be obtained and prepared in accordance with the Core Strength Test Method of Test Method C 497.

10.3.2 *Number of Cores*—One core shall be taken from a box section selected at random from each group of 15 box sections of a single size or fraction of such a group from each continuous production run.

10.4 *Acceptability on the Basis of Core Test Results:*

10.4.1 When the compressive strengths of cores tested for a group of box sections is equal to or greater than the design concrete strength, the compressive strength of the concrete for the group is acceptable.

10.4.2 If the compressive strength of the core tested is less than the design concrete strength, the box section from which that core was taken may be recored. If the compressive strength of the recore is equal to or greater than the design concrete compressive strength, the compressive strength of the concrete for the group is acceptable.

10.4.3 If the compressive strength of the recore is less than the design concrete strength, the box section from which the core was taken shall be rejected. Two box sections from the remainder of the group shall be selected at random and one core shall be taken from each box section. If the compressive strength of both cores is equal to or greater than the design concrete compressive strength, the concrete compressive strength of the remainder of the group shall be acceptable. If the compressive strength of either of the two cores tested is less than the design concrete compressive strength, then the remainder of the group shall be either rejected or, at the option of the manufacturer, each box section of the remainder of the group shall be cored and accepted individually, and any of the box sections that have a core with less than the design concrete compressive strength shall be rejected.

10.5 *Plugging Core Holes*—Core holes shall be plugged and sealed by the manufacturer in a manner such that the pipe section will meet all of the requirements of this specification. Pipe sections so plugged and sealed shall be considered satisfactory for use.

10.6 *Test Equipment*—Every manufacturer furnishing box sections under this specification shall furnish all facilities and personnel necessary to carry out the tests required.

11. Permissible Variations

11.1 *Internal Dimensions*—The internal dimensions shall not vary more than 1 % from the design dimensions. The haunch dimensions shall not vary more than ¼ in. from the design dimensions.

11.2 *Slab and Wall Thickness*—The slab and wall thickness shall not be less than that shown in the design by more than 5 % or 3/16 in., whichever is greater. A thickness more than that required in the design shall not be a cause for rejection.

11.3 *Length of Opposite Surfaces*—Variations in laying lengths of two opposite surfaces of the box section shall not be more than ⅛ in./ft of internal span, with a maximum of ⅝ in. for all sizes through 7 ft internal span, and a maximum of ¾ in. for internal spans greater than 7 ft, except where beveled ends for laying of curves are specified by the owner.

11.4 *Length of Section*—The underrun in length of a section shall not be more than ⅛ in./ft of length with a maximum of ½ in. in any box section.

11.5 *Position of Reinforcement*—The maximum variation in the position of the reinforcement for 5-in. or less slab and wall thicknesses shall be ±⅜ in., and for greater than 5-in. slab and wall thicknesses shall be ±½ in. In no case, however, shall the cover over the reinforcement be less than ⅝ in., as measured to the internal surface or the external surface. The preceding minimum cover limitation does not apply at the mating surfaces of the joint.

11.6 *Area of Reinforcement*—The areas of steel reinforcement shall be the design steel areas as shown in Tables 1, 2, or 3. Steel areas greater than those required shall not be cause

for rejection. The permissible variation in diameter of any wire in finished fabric shall conform to the tolerances prescribed for the wire before fabrication by either Specifications A 82 or A 496 as applicable.

12. Repairs

12.1 Box sections may be repaired, if necessary, because of imperfections in manufacture or handling damage and will be acceptable if, in the opinion of the owner, the repaired box section conforms to the requirements of this specification.

13. Inspection

13.1 The quality of materials, the process of manufacture, and the finished box sections shall be subject to inspection by the owner.

14. Rejection

14.1 Box sections shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual box sections may be rejected because of any of the following:

14.1.1 Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint,

14.1.2 Defects that indicate mixing and molding, not in compliance with 9.1, or honeycombed or open texture that would adversely affect the function of the box sections,

14.1.3 The ends of the box sections are not normal to the walls and center line of the box section, within the limits of variations given in Section 11, except where beveled ends are specified, and

14.1.4 Damaged ends, where such damage would prevent making a satisfactory joint.

15. Product Marking

15.1 The following information shall be legibly marked on each box section by indentation, waterproof paint, or other approved means.

15.1.1 Box section span, rise, table number, maximum and minimum, design earth cover, and specification designation,

15.1.2 Date of manufacture,

15.1.3 Name or trademark of the manufacturer, and

15.1.4 Each section shall be clearly marked by indentation on either the inner or outer surface during the process of manufacture so that the location of the top will be evident immediately after the forms are stripped. In addition, the word "top" shall be lettered with waterproof paint on the inside top surface.

16. Keywords

16.1 concrete box—precast; culvert

TABLE 1 Design Requirements for Precast Concrete Box Sections Under Earth Dead and HS20 Live Load Conditions[A]

NOTE 1—Design earth covers and reinforcement areas are based on the weight of a column of earth over the width of the box section as defined in Appendix X1. See Appendix X2 for modifications to reinforcement areas for other earth load conditions.

NOTE 2—Concrete design strength 5000 psi.

Design Earth Cover, ft[A]	M, min, in.	Circumferential Reinforcement Areas[B]			
		A_{s1}	A_{s2}	A_{s3}	A_{s4}
3 ft by 2 ft by 4 in.[C]					
2	17	0.19	0.20	0.21	0.10[D]
3	15	0.10	0.11	0.11	0.10[D]
4 to 8	15	0.10[D]	0.10[D]	0.10[D]	0.10[D]
10	15	0.10[D]	0.11	0.11	0.10[D]
12	14	0.10[D]	0.13	0.13	0.10[D]
14	14	0.11	0.14	0.14	0.10[D]
16	14	0.12	0.16	0.16	0.10[D]
18	14	0.13	0.17	0.18	0.10[D]
20	14	0.14	0.19	0.19	0.10[D]
3 ft by 3 ft by 4 in.[C]					
2	27	0.15	0.24	0.25	0.10[D]
3	20	0.10[D]	0.13	0.14	0.10[D]
4 to 6	17	0.10[D]	0.10[D]	0.10[D]	0.10[D]
8	15	0.10[D]	0.11	0.11	0.10[D]
10	15	0.10[D]	0.12	0.13	0.10[D]
12	15	0.10[D]	0.14	0.14	0.10[D]
14	15	0.10[D]	0.15	0.16	0.10[D]
16	15	0.10[D]	0.17	0.18	0.10[D]
18	15	0.10[D]	0.19	0.19	0.10[D]
20	15	0.11	0.21	0.21	0.10[D]
4 ft by 2 ft by 5 in.[C]					
2	19	0.26	0.22	0.20	0.12[D]
3	18	0.15	0.13	0.13	0.12[D]
4 to 8	18	0.12[D]	0.12[D]	0.12[D]	0.12[D]
10	17	0.13	0.13	0.14	0.12[D]
12	17	0.15	0.15	0.15	0.12[D]
14	17	0.17	0.17	0.17	0.12[D]
16	17	0.19	0.19	0.19	0.12[D]
18	17	0.21	0.21	0.21	0.12[D]
4 ft by 3 ft by 5 in.[C]					
2	22	0.21	0.27	0.24	0.12[D]
3	19	0.13	0.16	0.16	0.12[D]
4	18	0.12[D]	0.13	0.13	0.12[D]
5	18	0.12[D]	0.12[D]	0.13	0.12[D]
6	17	0.12[D]	0.12[D]	0.13	0.12[D]
8	17	0.12[D]	0.14	0.14	0.12[D]
10	17	0.12[D]	0.15	0.16	0.12[D]
12	17	0.12[D]	0.17	0.18	0.12[D]
14	17	0.13	0.20	0.20	0.12[D]
16	17	0.15	0.22	0.22	0.12[D]
18	17	0.16	0.24	0.24	0.12[D]
4 ft by 4 ft by 5 in.[C]					
2	34	0.18	0.30	0.28	0.12[D]
3	24	0.12[D]	0.18	0.18	0.12[D]
4	21	0.12[D]	0.14	0.15	0.12[D]
5	20	0.12[D]	0.13	0.14	0.12[D]
6	19	0.12[D]	0.14	0.14	0.12[D]
8	18	0.12[D]	0.15	0.15	0.12[D]
10	18	0.12[D]	0.16	0.17	0.12[D]
12	18	0.12[D]	0.19	0.19	0.12[D]
14	18	0.12[D]	0.21	0.21	0.12[D]
16	18	0.12[D]	0.23	0.24	0.12[D]
18	17	0.14	0.25	0.26	0.12[D]

Design Earth Cover, ft[A]	M, min, in.	Circumferential Reinforcement Areas[B]			
		A_{s1}	A_{s2}	A_{s3}	A_{s4}
5 ft by 3 ft by 6 in.[C]					
2	23	0.26	0.28	0.23	0.14[D]
3	21	0.17	0.18	0.18	0.14[D]
4	21	0.14[D]	0.15	0.15	0.14[D]
5	20	0.14[D]	0.14[D]	0.15	0.14[D]
6	20	0.14[D]	0.15	0.15	0.14[D]
8	20	0.14[D]	0.16	0.16	0.14[D]
10	20	0.15	0.18	0.19	0.14[D]
12	20	0.17	0.20	0.21	0.14[D]
14	20	0.19	0.23	0.23	0.14[D]
16	19	0.21	0.26	0.26	0.14[D]
18	19	0.23	0.28	0.29	0.14[D]
5 ft by 4 ft by 6 in.[C]					
2	28	0.23	0.32	0.27	0.14[D]
3	23	0.15	0.20	0.21	0.14[D]
4 to 6	22	0.14[D]	0.16	0.17	0.14[D]
8	20	0.14[D]	0.17	0.18	0.14[D]
10	20	0.14[D]	0.20	0.21	0.14[D]
12	20	0.14[D]	0.22	0.23	0.14[D]
14	20	0.16	0.25	0.26	0.14[D]
16	19	0.18	0.28	0.29	0.14[D]
18	19	0.20	0.31	0.31	0.14[D]
5 ft by 5 ft by 6 in.[C]					
2	41	0.20	0.35	0.29	0.14[D]
3	29	0.14[D]	0.22	0.23	0.14[D]
4	25	0.14[D]	0.18	0.19	0.14[D]
5	24	0.14[D]	0.17	0.18	0.14[D]
6	22	0.14[D]	0.17	0.18	0.14[D]
8	22	0.14[D]	0.18	0.19	0.14[D]
10	21	0.14[D]	0.21	0.22	0.14[D]
12	21	0.14[D]	0.23	0.24	0.14[D]
14	21	0.14[D]	0.26	0.27	0.14[D]
16	21	0.16	0.29	0.30	0.14[D]
18	20	0.17	0.32	0.33	0.14[D]
6 ft by 3 ft by 7 in.[C]					
2	29	0.30	0.29	0.22	0.17[D]
3	24	0.21	0.19	0.18	0.17[D]
4	24	0.18	0.17[D]	0.17[D]	0.17[D]
5	24	0.17[D]	0.17[D]	0.17[D]	0.17[D]
6	23	0.17[D]	0.17[D]	0.17[D]	0.17[D]
8	23	0.17[D]	0.18	0.18	0.17[D]
10	23	0.20	0.20	0.21	0.17[D]
12	23	0.23	0.23	0.24	0.17[D]
14	23	0.26	0.26	0.26	0.17[D]
16	23	0.28	0.29	0.29	0.17[D]
18	23	0.31	0.32	0.32	0.17[D]

TABLE 1 *Continued*

Design Earth Cover, ft[A]	M, min, in.	Circumferential Reinforcement Areas[B]			
		A_{s1}	A_{s2}	A_{s3}	A_{s4}
6 ft by 4 ft by 7 in.[C]					
2	28	0.26	0.33	0.26	0.17[D]
3	25	0.18	0.22	0.21	0.17[D]
4	24	0.17[D]	0.19	0.19	0.17[D]
5	23	0.17[D]	0.18	0.19	0.17[D]
6	23	0.17[D]	0.18	0.19	0.17[D]
8	23	0.17[D]	0.20	0.21	0.17[D]
10	22	0.18	0.23	0.24	0.17[D]
12	22	0.20	0.26	0.26	0.17[D]
14	22	0.22	0.29	0.30	0.17[D]
16	22	0.24	0.32	0.33	0.17[D]
18	22	0.27	0.35	0.36	0.17[D]
6 ft by 5 ft by 7 in.[C]					
2	33	0.24	0.36	0.29	0.17[D]
3	27	0.17[D]	0.24	0.23	0.17[D]
4 to 6	25	0.17[D]	0.20	0.21	0.17[D]
8	23	0.17[D]	0.21	0.22	0.17[D]
10	23	0.17[D]	0.24	0.25	0.17[D]
12	23	0.17[D]	0.27	0.29	0.17[D]
14	23	0.19	0.31	0.32	0.17[D]
16	22	0.21	0.34	0.35	0.17[D]
18	22	0.23	0.37	0.39	0.17[D]
6 ft by 6 ft by 7 in.[C]					
2	48	0.22	0.39	0.31	0.17[D]
3	33	0.17[D]	0.26	0.25	0.17[D]
4	29	0.17[D]	0.22	0.23	0.17[D]
5	27	0.17[D]	0.21	0.22	0.17[D]
6	26	0.17[D]	0.21	0.22	0.17[D]
8	25	0.17[D]	0.22	0.24	0.17[D]
10	24	0.17[D]	0.25	0.27	0.17[D]
12	24	0.17[D]	0.28	0.30	0.17[D]
14	24	0.17[D]	0.32	0.33	0.17[D]
16	24	0.19	0.35	0.37	0.17[D]
18	23	0.21	0.38	0.40	0.17[D]
7 ft by 4 ft by 8 in.[C]					
2	32	0.30	0.34	0.25	0.19[D]
3	27	0.21	0.23	0.21	0.19[D]
4	27	0.19[D]	0.20	0.20	0.19[D]
5	26	0.19[D]	0.20	0.21	0.19[D]
6	26	0.19[D]	0.20	0.21	0.19[D]
8	26	0.20	0.22	0.23	0.19[D]
10	25	0.23	0.25	0.26	0.19[D]
12	25	0.25	0.29	0.29	0.19[D]
14	25	0.28	0.32	0.33	0.19[D]
16	25	0.31	0.36	0.36	0.19[D]
18	25	0.34	0.39	0.40	0.19[D]
7 ft by 5 ft by 8 in.[C]					
2	32	0.27	0.37	0.28	0.19[D]
3	28	0.19[D]	0.26	0.23	0.19[D]
4 to 6	27	0.19[D]	0.22	0.23	0.19[D]
8	26	0.19[D]	0.24	0.25	0.19[D]
10	25	0.20	0.27	0.29	0.19[D]
12	25	0.22	0.31	0.32	0.19[D]
14	25	0.25	0.35	0.36	0.19[D]
16	25	0.27	0.38	0.40	0.19[D]
18	25	0.30	0.42	0.43	0.19[D]
7 ft by 6 ft by 8 in.[C]					
2	38	0.24	0.39	0.31	0.19[D]
3	31	0.19[D]	0.27	0.26	0.19[D]
4	29	0.19[D]	0.24	0.25	0.19[D]
5	28	0.19[D]	0.23	0.25	0.19[D]
6	27	0.19[D]	0.24	0.25	0.19[D]
8	26	0.19[D]	0.26	0.27	0.19[D]
10	26	0.19[D]	0.29	0.30	0.19[D]
12	26	0.20	0.33	0.34	0.19[D]
14	25	0.22	0.36	0.38	0.19[D]
16	25	0.25	0.40	0.42	0.19[D]
18	25	0.27	0.44	0.46	0.19[D]
7 ft by 7 ft by 8 in.[C]					
2	55	0.22	0.42	0.33	0.19[D]
3	38	0.19[D]	0.29	0.27	0.19[D]
4 to 6	33	0.19[D]	0.25	0.27	0.19[D]
8	28	0.19[D]	0.27	0.29	0.19[D]
10	27	0.19[D]	0.30	0.32	0.19[D]
12	27	0.19[D]	0.34	0.36	0.19[D]
14	27	0.21	0.37	0.39	0.19[D]
16	27	0.23	0.41	0.43	0.19[D]
8 ft by 4 ft by 8 in.[C]					
2	34	0.37	0.40	0.29	0.19[D]
3	31	0.27	0.28	0.24	0.19[D]
4	28	0.25	0.25	0.24	0.19[D]
5	28	0.26	0.25	0.26	0.19[D]
6	28	0.26	0.26	0.26	0.19[D]
8	27	0.28	0.28	0.29	0.19[D]
10	27	0.32	0.32	0.33	0.19[D]
12	27	0.36	0.36	0.37	0.19[D]
14	27	0.40	0.41	0.42	0.19[D]
8 ft by 5 ft by 8 in.[C]					
2	35	0.34	0.43	0.32	0.19[D]
3	31	0.25	0.31	0.27	0.19[D]
4	28	0.23	0.27	0.27	0.19[D]
5	28	0.24	0.27	0.29	0.19[D]
6	27	0.24	0.28	0.29	0.19[D]
8	27	0.26	0.30	0.32	0.19[D]
10	27	0.29	0.35	0.36	0.19[D]
12	27	0.32	0.39	0.41	0.19[D]
8 ft by 6 ft by 8 in.[C]					
2	36	0.31	0.46	0.35	0.19[D]
3	31	0.23	0.33	0.29	0.19[D]
4	30	0.22	0.29	0.29	0.19[D]
5	29	0.23	0.29	0.31	0.19[D]
6	28	0.22	0.30	0.31	0.19[D]
8	27	0.24	0.32	0.34	0.19[D]
10	27	0.27	0.37	0.39	0.19[D]
12	27	0.30	0.42	0.43	0.19[D]
8 ft by 7 ft by 8 in.[C]					
2	41	0.28	0.49	0.38	0.19[D]
3	35	0.22	0.35	0.32	0.19[D]
4	32	0.20	0.31	0.31	0.19[D]
5	31	0.21	0.31	0.33	0.19[D]
6	30	0.21	0.31	0.34	0.19[D]
8	29	0.22	0.34	0.36	0.19[D]
10	28	0.25	0.38	0.41	0.19[D]
12	28	0.28	0.43	0.46	0.19[D]

INDEPENDENT CONCRETE PIPE CONCRETE
(MISSOURI DIVISION)
12950 GRAVOIS RD.
ST. LOUIS, MO. 63127
(314) 842-2900

Contractor: Maverick Construction Management Services, Inc.

Project: Solutia – TRRA Over Dead Creek

Item: 6' x 6' Box Culvert, C-789 – 13'- 14' Cover HS-20 LD

This is to certify that the Reinforced Concrete Box Culvert we purpose to furnish for the above project meets the specifications of ASTM C-789 HS-20 Loading.

* This meets the requirements of Illinois Department of Transportation.

Ron Green,
Plant Manager

AreaI 001284

Independent Concrete Pipe Company
Missouri Division
12950 Gravois Road
St. Louis, Missouri 63127
Office: (314)842-2900
Fax: (314)842-5869

Precast Box Culvert Detail Sheet

Project Name: Solutia – TRRA Over Dead Creek

Contractor: Maverick Construction

Bill of Material

ITEM	Unit	Quantity
Precast Concrete Box Sections for Culvert	LF	312'

Precast Box Culvert to be manufactured in accordance to the latest edition of

ASTM C- **789** Design Load: **HS-20** Design Cover: **13' – 14'**

Size

Rise: **6'** X Span: **6'** Lay Length: **8'** Weight lbs./ft: **2550**

Wall Thickness

Top: **8"** Bottom: **7"** Sides: **7"** Haunch: **7"**

Required Steel Areas (ASTM C-789)

A s1 .17 A s5

A s2 .32 A s6

A s3 .33 A s7 .17

A s4 .17 A s8 .17

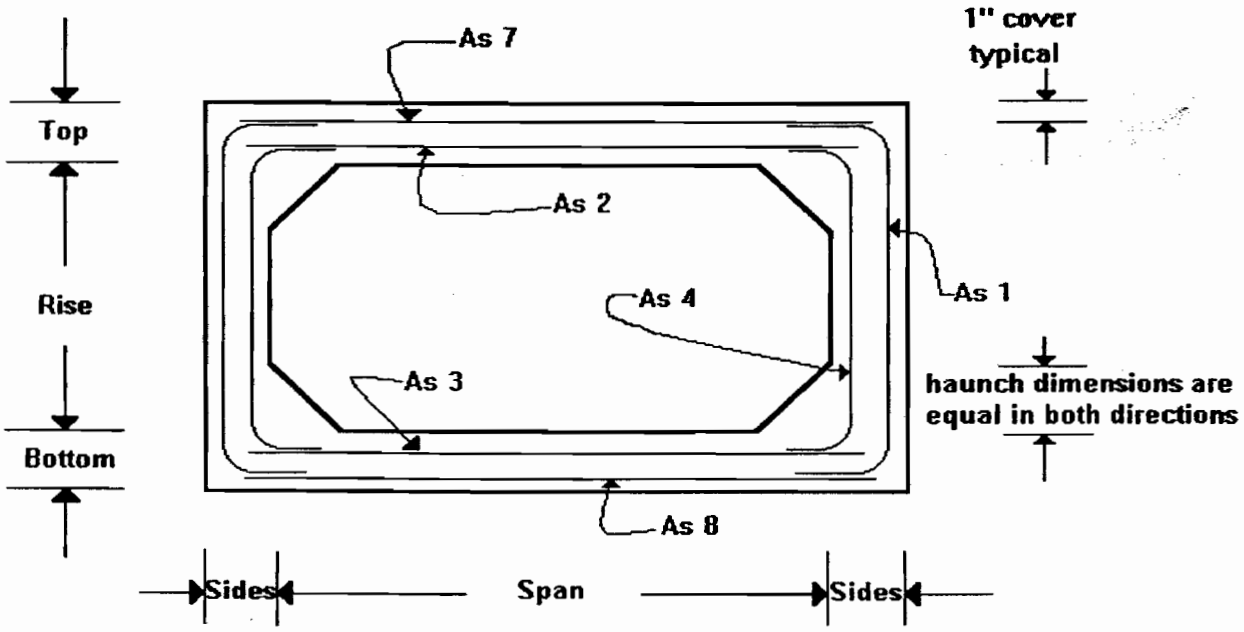
Actual Steel Areas

A s1 .24 A s5

A s2 .33 A s6

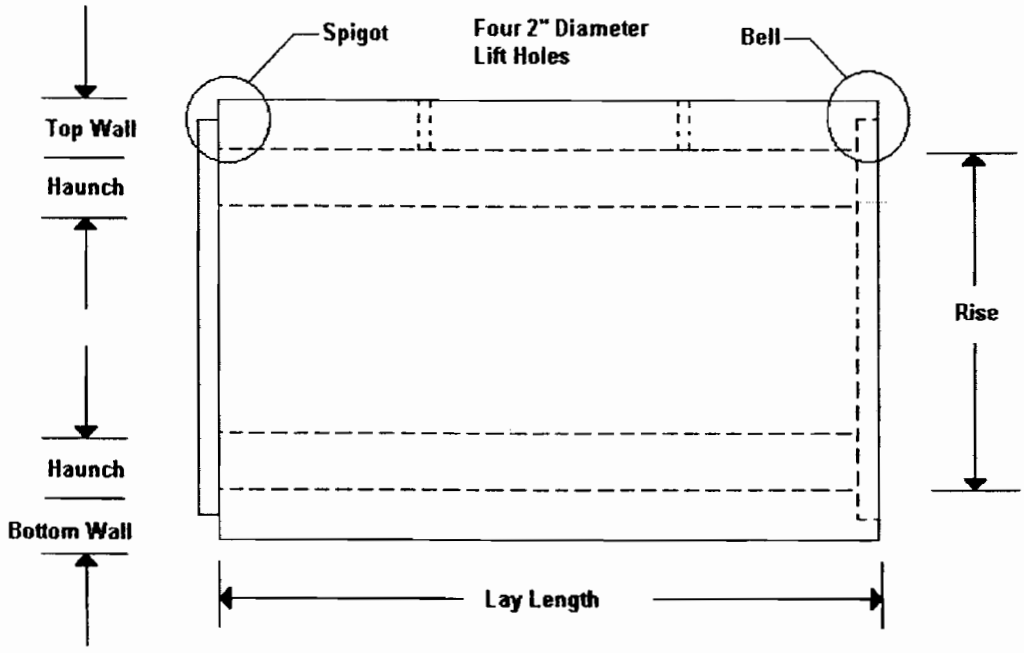
A s3 .33 A s7 .24

A s4 .24 A s8 .24



As, area of steel, sq. inches per ln. foot

Steel Layout



Dimensional Details

Areal 001286

Notes; See "Precast Box Culvert Detail Sheet" for specific steel areas and product dimensions.

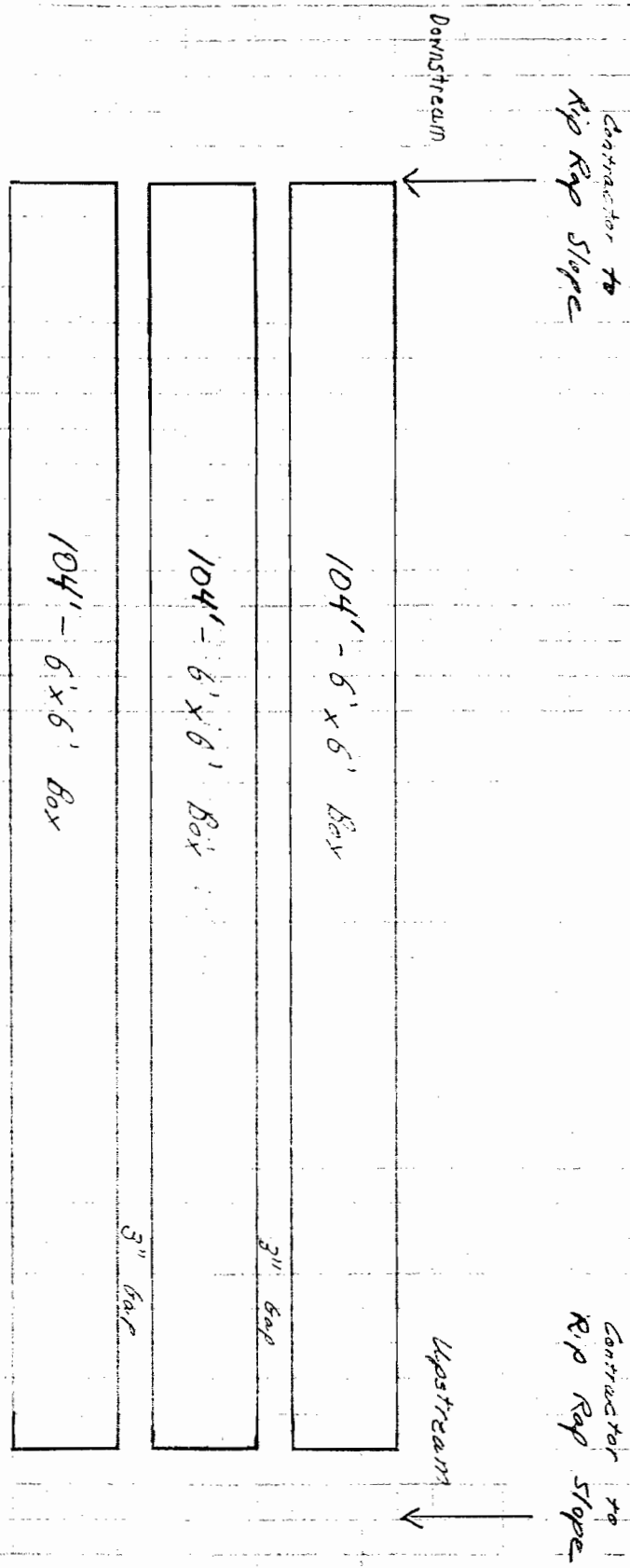
INDEPENDENT CONCRETE PIPE CORPORATION

ST. LOUIS PLANT
12950 GRAVOIS ROAD
St. LOUIS, MO 63127
PHONE 314/842-2900

FOR ECONOMY FOR PERMANENCE

ASTM C789
PRECAST BOX CULVERT
STEEL & DIMENSION DETAILS

DATE: 3/8/00
SCALE: none
NUMBER:



AreaI 001287

INDEPENDENT CONCRETE PIPE CORPORATION	PROJECT TRRA Over Dead Creek Box Culvert
SALES OFFICES — TELEPHONE	ITEM 6'x6'x8' Box C-789 H5-20 Ld 13'-14' Cover
INDIANAPOLIS, IN 317/262-4920	CHECKED BY
MISHAWAKA, IN 219/259-5401	DATE 6-16-2000
ST. LOUIS, MO 314/842-2900	
LOUISVILLE, KY 502/448-2920	
TOLEDO, OH 419/841-3361	

AreaI 001288

Appendix E

DAMES & E
A DAMES & MOORE GI OMP

721 Emerson Road, Suite 220
Saint Louis, Missouri 63141-6748
314 993 4599 Tel
314 993 4895 Fax

June 23, 2000

Mr. John Fiore
Maverick Construction Management Services, Inc.
15 Cedar Street
Auburn, MA 01501

Phone: 509-721-2227

Re: Dead Creek Culverts
TRRA and Cargill Road
Solutia, Inc.
Dames & Moore Project No. 11035-410-045

Dear Mr. Fiore:

Enclosed are 10 sets of the final construction plans for the referenced project.

An additional 2 sets are being sent to Mike Light at Solutia.

Please call me if you have any questions.

Very truly yours,

URS/Dames & Moore

Michael J. Brynac, P. E.
Associate

Encl.

Cc: Mike Light, Solutia

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